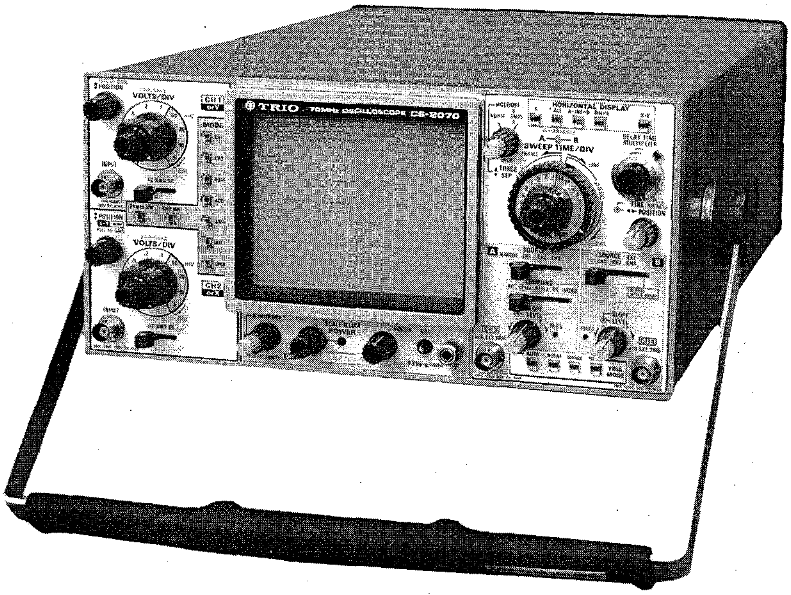
DELAYED SWEEP OSCILLOSCOPE

CS-2070

70MHz 4-CHANNEL OSCILLOSCOPE



Serial Number 2110001 ~ 3060100

TRIO

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SPECIFICATIONS

CRT

Model:	150CTM31
Display area:	8 × 10 div (1 div= 1 cm)
Type:	Rectangular, with internal graticule
Accelerating potential:	12 kV

VERTICAL AXIS (Channel 1 and Channel 2 identical specifications)

Sensitivity:	5 mV/div to 5V/div (X1 mode) 1 mV/div to 1V/div (X5 mode) 500 μV/div (Cascaded operation, CH1 to CH2)
Accuracy:	±3% (10 ~ 35°C) ±5% (0 ~ 50°C) ±8% (Cascaded operation, CH1 to CH2)
Attenuator:	5 mV/div to 5V/div in 1-2-5 sequence, all 10 ranges with fine adjustment.
Input resistance:	1 MΩ ±2%
Input capacitance:	Approx. 28 pF
Frequency response:	(Include × 5 GAIN mode)
DC:	DC to 70 MHz (−3 dB) DC to 80 MHz (−6 dB) DC to 40 MHz (−3 dB) (Cascaded operation, CH1 to CH2)
AC:	5 Hz to 70 MHz (−3 dB) 5 Hz to 80 MHz (−6 dB) 7 Hz to 40 MHz (−3 dB) (Cascaded operation, CH1, to CH2)
Risetime:	5ns
Signal delay time:	Approx 20ns as displayed on CRT screen
Crosstalk:	−40 dB minimum
Operating modes:	
CH1	CH1, single trace
CH2	CH2, single trace
DUAL	CH1 and CH2, dual trace
ADD	CH1 + CH2 (added) display
QUAD	CH1 ~ CH4, four trace
ALT	Two or four waveforms, alternating
CHOP	Two or four waveforms, chopped
CHOP frequency:	Approx 250 kHz
Polarity reversal:	CH2 only
Maximum input voltage:	500 Vp-p or 250V (DC + AC peak)
Maximum undistorted amplitude:	8 division, minimum (DC to 70 MHz)
Bandwidth limiting:	Vertical system bandwidth with the 20 MHz BW pushbutton switch pushed is approximately 20 MHz)

VERTICAL AXIS (Channel 3 and Channel 4 common specifications)

Sensitivity:	0.1V/div. ±3%
Input resistance:	1 MΩ ±2%
Input capacitance:	Approx. 28 pF
Input coupling mode:	DC only
Frequency response:	DC to 70 MHz (−3 dB) DC to 80 MHz (−6 dB)
Risetime:	5 ns
Signal delay time:	Same as CH1 and CH2
Maximum allowable voltage	
DC component:	±0.5V or less (AC + DC)
AC component:	1 Vp-p or less
Maximum input voltage:	50V (DC + AC peak)

HORIZONTAL AXIS (CH2 input)

Modes:	X-Y mode is switch selectable (HORIZONTAL DISPLAY)
X-Y mode:	CH1: Y-axis CH2: X-axis
Sensitivity:	Same as CH2
Accuracy:	Same as CH2
Input resistance:	Same as CH2
Input capacitance:	Same as CH2
Frequency response:	
DC:	DC to 5 MHz (−3 dB) DC to 6 MHz (−6 dB)
AC:	5 Hz to 5 MHz (−3 dB) 5 Hz to 6 MHz (−6 dB)
X-Y phase difference:	Less than 3° at 100 kHz

SWEEP

Modes (switchable with the HORIZONTAL DISPLAY switch):

A	A Sweep
ALT	B Sweep waveform is displayed as an intensified portion of the A Sweep and B Sweep alternating
A-INT-B	Duration of the B Sweep is displayed as an intensified portion of the A Sweep.
B DLY'D	Delayed B sweep
X-Y	X-Y display mode
A Sweep time:	50ns/div to 0.5s/div in 22 ranges, in 1-2-5 sequence, verninier control provides fully adjustable sweep time between steps.
B Sweep time:	50ns/div to 50ms/div in 19 ranges, in 1-2-5 sequence.
Accuracy:	±3% (10 ~ 35°C) ±6% (0 ~ 50°C)
Sweep magnification:	X10 ±5% (10 ~ 35°C) ±7% (0 ~ 50°C)

SPECIFICATIONS

Linearity:	50ns/div to 0.5s/div ±3% (±5% with X10 magnification)
HOLDOFF:	Continuously adjustable for A Sweep hold off time from NORM to X5.
Trace separation:	B positionable up to 4 divisions separated from A Sweep, continuously adjustable.
Delay method:	Continuous delay, SYNC delay
Delay time:	0.2 to 10 times the sweep time from 200ns to 0.5s, continuously adjustable.
Time difference measurement accuracy:	±2% (10 ~ 35 °C) ±4% (0 ~ 50°C)
Delay jitter:	1/20000 of the full scale sweep time.

TRIGGERING

A TRIG

A trigger modes:	AUTO, NORM, SINGLE,
Trigger source:	V MODE, CH1, CH2, EXT CH3
Coupling modes:	AC, LFREJ, HFREJ, DC, VIDEO VIDEO-LINE sync automatically selected at sweep times of 50 µs/div to 50ns/div. VIDEO-FRAME sync automatically selected at sweep times of 0.5s/div to 0.1ms/div.
Trigger level:	±90° adjustable
Polarity:	+/−

B TRIG

Trigger source:	CH1, CH2, EXT CH4, STARTS AFTER DELAY
Coupling modes:	AC only
Trigger level:	±90° adjustable
Polarity:	+/−

TRIGGER SENSITIVITY (A AND B)

COUPLING	FREQ RANGE	MINIMUM SYNC AMPLITUDE	
		INT	EXT
DC	DC ~ 20 MHz DC ~ 70 MHz	0.5div 1.5div	50 mV 150 mV
AC	Same as for DC but with increased minimum level for below 20 Hz		
AC HFREJ	Increased minimum level below 20 Hz and above 30 kHz		
AC LFREJ	Increased minimum level below 30 kHz		
VIDEO	FRAME/LINE	0.5div	50 mV

AUTO: Same as above specifications for above 30 Hz.

Jitter:	1ns maximum at 70 MHz at 5ns/div sweep rate (X10 MAG on)

CALIBRATING VOLTAGE

1 kHz ±3% Positive square wave
0.3V ±1% (10 ~ 35°C)
±2% (0 ~ 50°C)

INTENSITY MODULATION

Input signal:	TTL level, intensity increasing with more positive levels
Input impedance:	Approx. 10 kΩ
Usable frequency range:	DC to 10 MHz
Maximum input voltage:	50V (DC + AC peak)

VERTICAL AXIS OUTPUT

Sampled CH1 output

Output voltage:	50 mVp-p/div (into 50Ω load)
Output impedance:	Approx. 50Ω
Frequency response:	DC to 70 MHz (−3 dB) (into 50Ω load)

TRACE ROTATION

Electrical, adjustable

POWER SUPPLY

Line voltage:	LOW: 90 ~ 132V HIGH: 180 ~ 264V
Line frequency:	50/60 Hz
Power consumption:	Approx. 56W

DIMENSIONS

Width:	284 mm (328 mm)
Height:	138 mm (150 mm)
Depth:	400 mm (471 mm)

( ) dimensions include protrusions from basic case outline dimensions.

WEIGHT

7.4 kg

ACCESSORIES

PC-29 Probes	2
Instruction Manual	1
Handbook	1
AC power cord	1
Probe holder	1

OPTION

Accessory Bag (MC-78)
Panel Cover (MD-85)

ENVIRONMENT

Operating temperature and humidity for guaranteed specifications:	10 ~ 35°C, 85% maximum RH
Full operating range:	0 ~ 50°C, 90% maximum RH
Storage temperature:	−20 ~ 55°C
and humidity range:	80% maximum
Altitude:	
Operating:	5000 m
Non-operating:	12000 m

CIRCUIT DESCRIPTION

VERTICAL ATTENUATOR

The CS-2070 input attenuator consists of two stages of attenuation-on having 1/2, 1/4 and 1/10 steps and the other having either 1/10 or 1/100 attenuation to form an overall ten point attenuator in 1-2-5 sequence.

The signal from the attenuator is passed to a dual FET impedance conversion circuit (Q1). Its output is sent to IC12. Variable gain is achieved by varying the emitter resistance of IC12.

The output of IC12 is sent to the vertical pre-amp.

The arrangement for CH2 is the same as for CH1.

VERTICAL MODE LOGIC CIRCUIT

Instead of the usual mechanical switches used on other instruments the CS-2070 makes use of electronic switching. The switches themselves generate a single pulse output when operated so that the various combinations of switches and holding of selected modes must be done with external logic circuitry. The circuit that accomplishes this is the Vertical Mode Logic Circuit. The pulses generated when the switches are operated are shaped by a schmitt trigger circuit and sent to the rest of the circuitry. IC6 is a latch used to hold a single pulse. The input signal, passing through the circuit formed by D5-D11 and IC3, IC2 and IC7 is a delayed pulse which acts as the trigger for IC6. In this way IC6 holds the data that represents the fact that a switch has been depressed. IC4 acts as a logical single pole double throw switch to select one of DUAL/QUAD and ALT/CHOP. CH2 inverter and 20MHz BW switching functions are managed (ON-OFF) by IC10 which acts as a SPST switch. The output of IC4 is also latched into IC6. The output of IC6 is used to drive the vertical mode LED's through IC8, IC11, IC5 and IC9.

VERTICAL PRE-AMP CIRCUIT

The CS-2070 has four pre-amp circuits to allow 4-channel operation. The output of the vertical attenuator is fed to IC1, an amplifier.

For CH2 an inverting stage, IC2, is provided to allow switched inversion of that channel only. Q2 and Q3 form the CH1 position circuit.

Q50 and Q51 form the CH2 position circuit which operates in a similar fashion to the circuit for CH1. Q4 and Q5 are x1 amplifier stages (for CH1) and Q6, Q7 are x5 amplifier stages. The circuit formed by Q8 and Q9 is used to switch between × 1 and × 5 gain for CH1. For CH2, Q52/Q53 and Q54/Q55 along with Q56 and Q57 have the same functions. Q10/Q11 and Q19/Q20 for a cascoded amplifier.

Q18 and Q21 in combination with Q19 and Q20 form a switching circuit. This circuit is used to turn the CH1 signal on and off.

Q12 and Q13 form the trigger amplifier. The trigger signal passes through the buffer output amplifier formed by Q14 and Q15, being converted to 50Ω impedance and is sent to the A trigger switch circuit. For channel 1 only, the vertical signal passes through the stage formed by Q16 and Q17 to the rear panel connector for CH1 output. The circuit configuration for CH2, CH3 and CH4 is similar except that the CH3 and CH4 position adjustment is accomplished by means of PCB mounted trimmers VR1 and VR2.

The CH1 through CH4 signals are amplified by the output amplifier formed at the base side of the emitter follower formed by Q42 and Q43. This amplifer consists of Q44 and Q45 whose output is sent to the delay line.

Q38/Q39 and Q40/Q41 for the trigger amplifier which sends the signal of the output amplifier to the A trigger switch circuit and acts as the V MODE trigger source. Q37 acts as the load resistance switch for the ADD mode. Q33-Q36 form the 20MHz bandwidth circuit which limit the vertical bandwidth to −3dB down at 20MHz.

CH1 through CH4 signals are switched by the logic circuit formed by IC3 - IC7 in accordance with the vertical mode and horizontal mode selected.

VERTICAL OUTPUT AMPLIFIER

The signal from the delay line is sent to the vertical output amplifier. Q1, Q2, Q3 and Q4 form a cascoded differential input amplifier. Q11 forms a bias current stabilization circuit.

Q7 −Q10 form the final output stage.

Q5 forms the trace separation circuit.

A TRIGGER SWITCH CIRCUIT

The CH1-CH4, V MODE signals are sent to the A trigger switch circuit. S1 is the trigger source switch with S2 acting as the trigger coupling selection switch.

Q3 and Q4 form the VIDEO sync circuit which detects the trigger signal of the TV picture signal for stable display.

Q6 and Q7 form an impedance converting emitter follower circuit to lower the output impedance to drive the next stage. Q8 and Q9 form a circuit which is used to improve the CMRR. This circuit is a feedback amplifier. IC1 is a cascode amplifier used as the polarity reversal (inversion) circuit for the trigger signal. Q10 forms an impedance conversion stage used to convert the output of the IC1 stage to 50Ω for output to the horizontal sweep unit.

B TRIGGER SWITCH CIRCUIT

Basically this circuit operates as does the A trigger switch circuit. Q1 accepts the CH2 trigger input and uses this signal to form the X signal for X-Y operation. Other aspects of operation are the same as the A trigger switch circuit.

SWEEP ROTARY CIRCUIT

This circuit is a part of the sweep circuit, but is located on a separate board. It is composed of a rotary switch to select the sweep time and resistors of the HOLDOFF circuit.

CIRCUIT DESCRIPTION

HORIZONTAL SWEEP CIRCUIT

This sweep circuit uses a constant current integrated circuit to obtain sawtooth waveform by charging capacitor with constant current.

Q14, Q16, and Q18 form the circuit that switches the sweep time capacitor for A sweep. In the case of B sweep the same operation is carried out by transistors Q43, Q45 and Q47.

Q13, Q15 and Q17 form the circuit that switches holdoff capacitor for A sweep.

The voltage supplied by the constant voltage circuit is converted to a constant current source by the voltage setting circuit comprised of IC3a and transistor Q8 and the resistor which is selected by the rotary switch.

This current is used to charge the sweep time capacitor, and result in a rise voltage at the capacitor terminals. This voltage is sent to a high impedance buffer amplifier composed of Q19 and Q20.

When the output of this amplifier reaches a constant voltage vlaue, IC7d is switched on and IC2b flip-flop is reset. At the same time IC2a is set.

The output of IC2 turns on Q7 and enshorts the sweep time capacitor.

The terminal output voltage of the capacitor falls. In addition the constant current circuit which is composed of Q22 charges one of the following holdoff capacitors; C13, C19, or C23.

The terminal voltage of the capacitor increases step by step. When this terminal voltage goes beyond the threshold level Q23 is turned on.

The output of Q23 turns on the SCHMIDT trigger circuit which is composed of IC2b. The output of IC2b cancels the set condition of IC2a and sweep is once again started. The trigger signal synchronizes IC2a through IC1a, IC1b.

It cancels the set of the flip-flop when it is in the set state and starts the sweep which is synchronized to the trigger signal.

The SCHMITT trigger circuit is composed of IC1a and IC1b. The trigger signal which is smoothed by IC1a and IC1b is supplied to IC1c, Q3 and Q4. When there is a trigger signal, IC1d gate is closed and IC2a operates as the master slave flip-flop.

When there is no trigger signal IC2a opens the gate of IC1d and operates R-S flip-flop. This is the auto free run circuit.

Q24 to Q26 form the delay sweep level detection circuit.

When the voltage level increases as set by DELAY TIME MULTIPLIER, Q24 is turned on and triggers IC8a gate, IC8a and IC10b compose the logic differential circuit. It makes constant width pulse which activates IC5b and starts B sweep circuit is approximately the same as A sweep circuit, but it does not have 3 low speed ranges. IC4d gate is selected from master slave flip-flop using B STARTS AFTER DELAY switch, and has trigger priority to R-S flip-flop.

The sweep can be started from the voltage level set by the DELAY TIME MULTIPLIER. A sweep horizontal position adjustment is carried out by Q53, and B sweep by Q54. The selection of HORIZONTAL DISPLAY is carried out by Q55 to Q58.

A and B sweep waveforms are synthesized by Q55 and Q58 collectors and X-Y signal is also synthesized at this point by Q59.

The signal through Q60 enhances CMRR and is sent to next stage by Q62 and Q63. Q64 and Q65, and Q66 and Q67 are selected times one and times ten (X1 and X10) by Q69 and Q68 respectively. The impedance is converted to 50 ohms and is sent to the horizontal output amplifier by Q70 and Q71.

The trace SEP circuit is composed of Q78 to Q80 and two different bias voltages are sent to the vertical output amplifier by the A and B sweep signals.

IC8d is the reset-pulse generator circuit in the case of signal sweep operation and also produces the blanking control signal when it is necessary to produce horizontal display using IC13a, IC14a and IC14e.

This circuit combines the sweep and chop signal using IC11a, IC11b, IC11c, IC11d and IC12d. The impedance is converted in Q72 to Q75.

This signal becomes the input signal of the blanking circuit.

The signal in the case of DUAL or QUAD setting of the vertical axis mode is produced in IC12a IC12b, IC13b, IC14c, IC14d, IC15a, IC15b, IC15c and IC15d and D48 to D50. IC12a and IC12b comprise the chop oscillator. The vertical mode logic and horizontal mode logic signal switch this oscillator on and off.

In the case of oscillation stopping this oscillator produces an alternate signal output.

On receiving a signal from IC14e, the output of IC12a and IC12b is turned off in the case of vertical axis single trace operation by IC15d.

However this output can be supplied in another case. The output of Q77 is supplied to the vertical amplifier and the output is separated into chop and alternate signals.

HORIZONTAL MODE CONTROL CIRCUIT

The switch states are latched by IC4 and IC7 which effectively makes these non-locking switches into locking types functionally.

For horizontal display D1-D9 and IC1d—IC1f are used to hold 3 bits of coded status information. Waveform shaping is used in the IC1 circuit to prevent misoperation. Diodes D10—D12 and IC2c—IC2e and IC3d form a circuit that is used to detect what switch of the horizontal group has been depressed.

The detected switch data is entered into the register IC4 which then holds the switch status. IC5 is a tri-state buffer. IC6 is used to restore the encoded switches status information on a one to one basis for all functions. Switch status held until a particular switch is pressed for a second time. The output of IC6 is used to drive an LED and as a control signal for blanking and sweep switching. The operation of the trigger mode switch input is the same as for the horizontal display switch group. Diodes D13-D16 and IC1a and IC1b are used to encode 2 bits of switch status information for this switch group after pulse shaping is done. D17, D18 IC2a, IC2b, IC2f and IC3a determine whether an input is present, writing into the register IC7a and IC7b the appropriate status information.

This register holds the switch status encoded information until IC8 is used to cancel, or return the status information based on alternate operation of the switches. Similar to the

CIRCUIT DESCRIPTION

horizontal display switch group, once depressed a switch mode is maintained until the switch is depressed once more. IC5a, IC5b, and IC5c are tri-state buffers. IC9a, IC9b, and IC9d — IC9f along with Q1 — Q3 form buffers for the switch LED's and sweep circuit. The output from the trigger mode reset switch is pulse shaped and sent to the trigger sweep circuit.

This circuit holds data even when the instrument's power supply switch is turned OFF. That control is performed by Q4, D19, D20, D31, D100, IC3 and IC8a.

D19 and D20 form a power supply based on the capacitor for memory. IC3b and IC3c detect the power OFF condition and generate a memory save signal. The output of the above circuit forms the set of control signals used to control the vertical mode logic circuitry.

CALIBRATING VOLTAGE CIRCUIT

Q11 and Q12 form a multivibrator circuit which generates a signal which is subsequently converted to a low impedance by means of Q10 for output as the calibration signal. IC17 is used to regulate the voltage generated by this calibration circuit.

CH3 and CH4 INPUT CIRCUITS

These circuits consist of buffer amplifier. The signal from the input terminal (BNC) is impedance converted with the circuit formed by Q13a, Q13b, Q14 and Q15 and sent to the vertical pre-amplifier. The operation and configuration of the CH4 circuit is similar to the CH3 circuit.

HORIZONTAL OUTPUT AMPLIFIER

The signal from the horizontal sweep circuit is amplified by the differential amplifier formed by Q1 and Q2. The output signal of this circuit is then passed to the emitter follower circuit formed by Q5 and Q6 for impedance conversion to enable driving the circuit formed by Q7 and Q8. Q9 and Q10 form a voltage regulation circuit which serves as the DC load for Q7 and Q8 respectively with AC peaking performed by means of C15 and C16. Q11 and Q12 form an auto-bias circuit which automatically controls the operating point of the output stage.

SWITCHING POWER SUPPLY UNIT

Although the CS-2070 is light and compact, and make use of a switching regulator type power supply.

Input of either 100V of 200V is rectified and a smoothing capacitor is used to generate a smooth DC output of approximately 200V.

Next, a power transistor is used to convert this output to an AC voltage which is used to drive a compact type converter transformer. The transformer used has 6 bifilar windings which create six separate outputs which are then rectified and smoothed to provide the supply for the blanking unit directly. One of the outputs is compared with a reference voltage to form an error voltage used for regulation. The error voltage is sent to the error voltage amplifier, the output of which is used to control the base of the power transistor. This output is isolated from the primary by means of a photocoupler.

POWER BLANKING UNIT

The five remaining outputs from the switching regulator power supply are further regulated using a series regulation method. This accomplished with Q1, Q3—Q6. IC1a, IC1b, IC2a and IC2b are error voltage amplifiers. The +20V derived by use of a resistance voltage divider. A conventional high voltage DC-DC converter is used. Q25—Q27 are error voltage amplifiers with Q29 acting as a control transistor. The CS-2070 provides independent A and B sweep intensity controls. This function is implemented by means of the circuit formed by Q13 — Q15. Q17 forms the external intensity (Z-axis) modulation circuit which accepts an input and results in brighter displays for increasing inputs.

The signals from these circuits are combined at the base of Q18 to drive Q19. Q20 forms the DC load for Q19 with C25 acting to provide AC peaking for this circuit. Q21 and Q22 form the auto-focus circuit which apply a signal to the focus electrodes of a reverse phase from the blanking signal. Q23 and Q24 act to restore the DC component of the blanking and auto-focus circuits by using differential amplifiers for isolation. Q8 controls scale illumination with Q9 and Q10 controlling the adjustment of trace rotation.

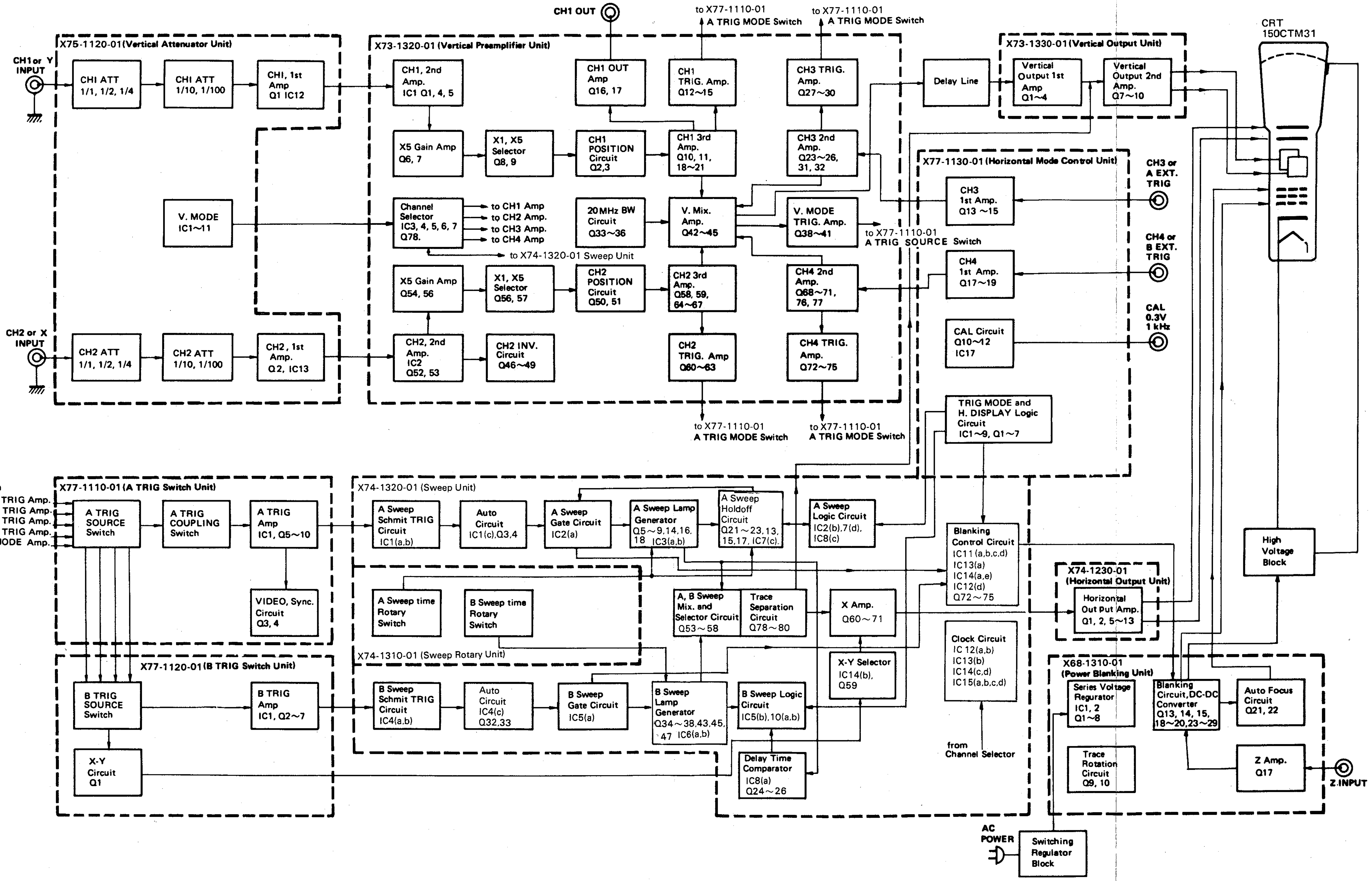
HIGH VOLTAGE UNIT

The post-acceleration voltage of the CS-2070 is 12 kV requiring the high voltage unit to be protected from the hands of the user if safety is to be maintained.

This protection also is required to prevent leakage.

To achieve this goal, the high voltage unit of the CS-2070 has been encapsulated in resin to form a high voltage "block". In the block are the high voltage DC to DC converter as well as the 1.7 kV cathode voltage supplies rectifier. In addition to the anode cap which makes available 10 kV, the block has 1.7 kV DC and 6.3V AC outputs.

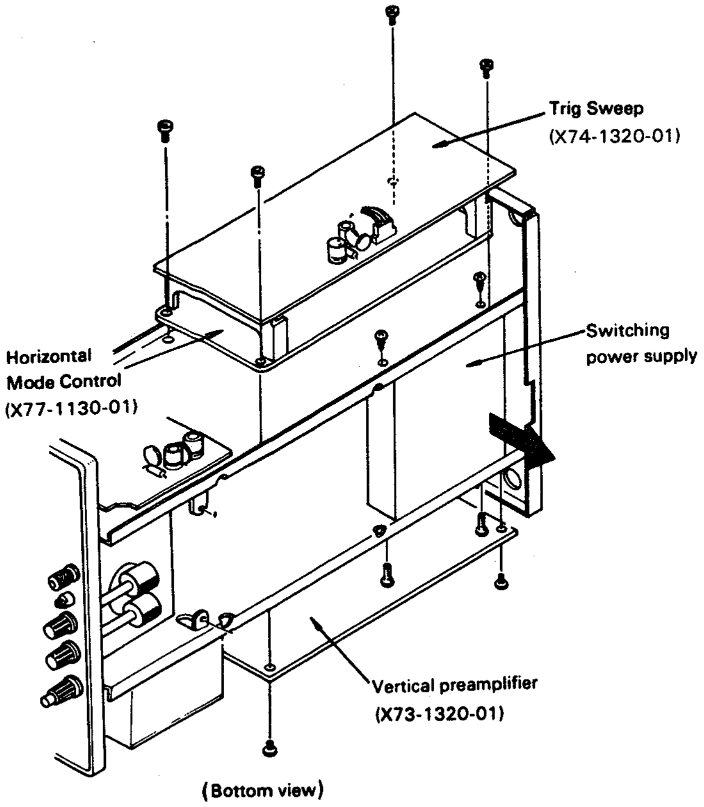
BLOCK DIAGRAM


CH1 OUT
to X77-1110-01 A TRIG MODE Switch
to X77-1110-01 A TRIG MODE Switch
CRT 150CTM31
CH1 or Y INPUT
X75-1120-01 (Vertical Attenuator Unit)
CH1 ATT 1/1, 1/2, 1/4
CH1 ATT 1/10, 1/100
CH1, 1st Amp Q1 IC12
X73-1320-01 (Vertical Preamplifier Unit)
CH1, 2nd Amp. IC1 Q1, 4, 5
CH1 OUT Amp Q16, 17
CH1 TRIG. Amp. Q12~15
CH3 TRIG. Amp. Q27~30
Delay Line
X73-1330-01 (Vertical Output Unit)
Vertical Output 1st Amp Q1~4
Vertical Output 2nd Amp. Q7~10
X5 Gain Amp Q6, 7
X1, X5 Selector Q8, 9
CH1 POSITION Circuit Q2,3
CH1 3rd Amp. Q10, 11, 18~21
CH3 2nd Amp. Q23~26, 31, 32
X77-1130-01 (Horizontal Mode Control Unit)
CH3 or A EXT. TRIG
V. MODE IC1~11
Channel Selector IC3, 4, 5, 6, 7 Q78.
to CH1 Amp
to CH2 Amp.
to CH3 Amp.
to CH4 Amp
20MHz BW Circuit Q33~36
V. Mix. Amp. Q42~45
V. MODE TRIG. Amp. Q38~41
to X77-1110-01 A TRIG SOURCE Switch
CH3 1st Amp. Q13 ~15
to X74-1320-01 Sweep Unit
X5 Gain Amp Q54, 56
X1, X5 Selector Q56, 57
CH2 POSITION Circuit Q50, 51
CH2 3rd Amp. Q58, 59, 64~67
CH4 2nd Amp. Q68~71, 76, 77
CH4 1st Amp. Q17~19
CH4 or B EXT. TRIG
CAL 0.3V 1 kHz
CAL Circuit Q10~12 IC17
CH2 or X INPUT
CH2 ATT 1/1, 1/2, 1/4
CH2 ATT 1/10, 1/100
CH2, 1st Amp. Q2, IC13
CH2, 2nd Amp. IC2 Q52, 53
CH2 INV. Circuit Q46~49
CH2 TRIG. Amp Q60~63
CH4 TRIG. Amp. Q72~75
to X77-1110-01 A TRIG MODE Switch
to X77-1110-01 A TRIG MODE Switch
TRIG MODE and H. DISPLAY Logic Circuit IC1~9, Q1~7
from CH1 TRIG Amp. CH2 TRIG Amp. CH3 TRIG Amp. CH4 TRIG Amp. V. MODE Amp.
X77-1110-01 (A TRIG Switch Unit)
A TRIG SOURCE Switch
A TRIG COUPLING Switch
A TRIG Amp IC1, Q5~10
X74-1320-01 (Sweep Unit)
A Sweep Schmit TRIG Circuit IC1(a,b)
Auto Circuit IC1(c),Q3,4
A Sweep Gate Circuit IC2(a)
A Sweep Lamp Generator Q5~9,14,16, 18 IC3(a,b)
A Sweep Holdoff Circuit Q21~23,13, 15,17, IC7(c).
A Sweep Logic Circuit IC2(b),7(d), IC8(c)
Blanking Control Circuit IC11(a,b,c,d) IC13(a) IC14(a,e) IC12(d) Q72~75
High Voltage Block
VIDEO, Sync. Circuit Q3, 4
A Sweep time Rotary Switch
B Sweep time Rotary Switch
A, B Sweep Mix. and Selector Circuit Q53~58
Trace Separation Circuit Q78~80
X Amp. Q60~71
X74-1230-01 (Horizontal Output Unit)
Horizontal Out Put Amp. Q1, 2, 5~13
X74-1310-01 (Sweep Rotary Unit)
X77-1120-01 (B TRIG Switch Unit)
X-Y Selector IC14(b), Q59
Clock Circuit IC12(a,b) IC13(b) IC14(c,d) IC15(a,b,c,d)
X68-1310-01 (Power Blanking Unit)
B TRIG SOURCE Switch
B TRIG Amp IC1, Q2~7
B Sweep Schmit TRIG Circuit IC4(a,b)
Auto Circuit IC4(c) Q32,33
B Sweep Gate Circuit IC5(a)
B Sweep Lamp Generator Q34~38,43,45, 47 IC6(a,b)
B Sweep Logic Circuit IC5(b),10(a,b)
Series Voltage Regurator IC1, 2 Q1~8
Blanking Circuit,DC-DC Converter Q13, 14, 15, 18~20,23~29
Auto Focus Circuit Q21, 22
X-Y Circuit Q1
Delay Time Comparator IC8(a) Q24~26
from Channel Selector
Trace Rotation Circuit Q9, 10
Z Amp. Q17
Z.INPUT
AC POWER
Switching Regulator Block

MAINTENANCE

REPLACING SWITCHING POWER SUPPLY

The switching power supply is housed in the shield case located at the rear. To remove the switching power supply, remove the horizontal logic circuitry (right) and vertical preamplifier (left) and remove the retaining screws which fix the shield case to the frame.


Trig Sweep
(X74-1320-01)
Switching
power supply
Horizontal
Mode Control
(X77-1130-01)
Vertical preamplifier
(X73-1320-01)
(Bottom view)

Replacing switching power supply

TROUBLESHOOTING

1. Confirm that the voltage selector is set to the correct position.
2. If one of the mode LEDs does not light, the unit will not operate correctly. When using the unit, confirm that the LED lights up.
3. To service the unit effectively, isolate the failure first. Then, remove the case and check the wiring, P.C.B. pattern and parts.
4. A low voltage power supply will affect the circuitry. Do not use the low voltage power supply for checking.

ADJUSTMENT

To obtain the best performance, periodically accurately calibrate the unit.

Sometimes, only one mode need be calibrated, while at other times, all modes should be calibrated.

When one mode is calibrated, it must be noted that the other modes may be affected. When calibrating all modes, perform the calibration in the specified sequence.

The following calibration required an accurate measuring instrument and an insulated adjusting flat blade screwdriver. If they are not available, contact your dealer.

For optimum adjustment, turn the power on and warm up the CS-2070 sufficiently (more than 30 minutes) before starting.

CAUTION:

Calibrate the unit under the following condition.
Temperature: 10 – 35°C
Humidity: Less than 85%

POWER SUPPLY VOLTAGE

Before calibrating the unit, check the power supply voltage.

Voltage selector: LOW; 90 – 132V
HIGH; 180 – 264V
50/60 Hz

TEST EQUIPMENT REQUIRED

The following instrument or their equivalent should be used for making adjustments.

Test Equipment	Model	Minimum Specification
Digital Multi-Meter	DL-720 (TRIO)	Impedance: More than 10 MΩ, Measuring range: 0.01V to 199V
Sine-Wave Generator	SG-502 (Tektronix)	Frequency: 10 Hz to 10 MHz, constant voltage over tuning range
Sine-Wave Generator	SG-503 (Tektronix)	Frequency: 50 kHz to 100 MHz, Output impedance: 50Ω, constant voltage over tuning range.
Square-Wave Generator	PG-506 (Tektronix)	Output signal: 1 kHz, Amplitude: 10 mVp-p to 10 Vp-p, Accuracy: within ±1%, Rise time: 35ns or less (1 MHz, 1ns or less)
Q Meter	4343B (YHP)	–
Color Pattern Generator	CG-911A (TRIO)	–
Oscilloscope	475A (Tektronix)	Sensitivity: More than 5 mV Frequency response: More than 250 MHz
Time-Marker Generator	TG-501 (Tektronix)	Time mark: 0.5s to 0.1μs repetitive waveform, accuracy: within 0.1%
High-Voltage Probe	–	Input Impedance: 1000 MΩ
Termination	TA-57 (TRIO)	Impedance: 50Ω
Attenuator	011-0059-02	–20 dB attenuation (50Ω)
Power Meter	2041 (YEW)	–
Auto transformer (variable)	SD-265 (Tektronix)	–
Current Probe	P6302 AM-503 (Tektronix)	–
Frequency Counter	FC-754A (TRIO)	–

PREPARATION FOR ADJUSTMENT

Control Setting

The control settings listed below must be used for each adjustment procedure. Exceptions to these settings will be noted as they occur. After completing a adjustment, return the controls to the following settings.

Power Section

POWER	ON

CRT Control Section

A INTEN	Between 12 and 3 o'clock position
B INTEN	Between 12 and 3 o'clock position
FOCUS	Optimum position
SCALE ILLUM	Arbitrary position

Vertical Section

VARIABLE (CH1 and CH2)	CAL
↕ POSITION (CH1 and CH2)	12 o'clock position
AC-GND-DC (CH1 and CH2)	AC
VOLTS/DIV (CH1 and CH2)	5V/DIV
× 5 GAIN	OFF

Horizontal Sweep Section

A SWEEP TIME/DIV	0.1ms/DIV
B SWEEP TIME/DIV	0.1ms/DIV
A VAR	CAL
DELAY TIME MULTIPLIER	Arbitrary position
↕ TRACE SEP.	Fully CCW
HOLDOFF	NORM
B ENDS A	OFF
↔ POSITION	12 o'clock position
FINE PULL × 10 MAG	12 o'clock position (× 10 MAG OFF)

TRIG. Section

A TRIG SOURCE	V. MODE
A COUPLING	AC
A TRIG LEVEL	12 o'clock position
A TRIG SLOPE	+
B TRIG SOURCE	CH1
B TRIG LEVEL	12 o'clock position
B TRIG SLOPE	+

Mode Section

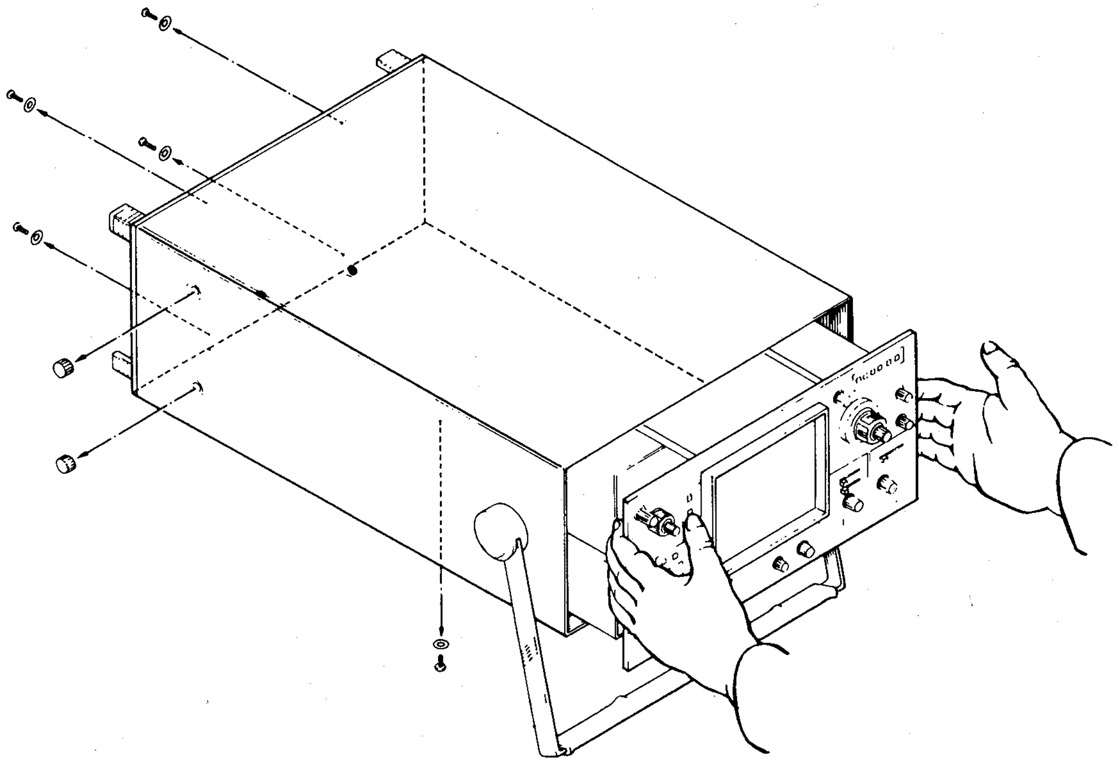
V. MODE	CH1
20MHz BW	OFF
CH2 INV	OFF
TRIG. MODE	AUTO
HORIZONTAL DISPLAY	A

MAINTENANCE

REMOVAL OF CASE

1. Pull out CH3 and CH4 POSITION knobs.
2. Remove the 4 screws located at the rear of the case and the 1 located at bottom with a ⊕ screwdriver. Carefully slide the body forward from the case.
3. To install the body in the case, place the case horizontally and slide the body into the case using the rails located at the bottom of the case. Then, place the body vertically and engage the case front edge into the front panel groove.
4. Temporarily insert the case retaining screws and then tighten them evenly.
5. Install the CH3 and CH4 POSITION knobs.

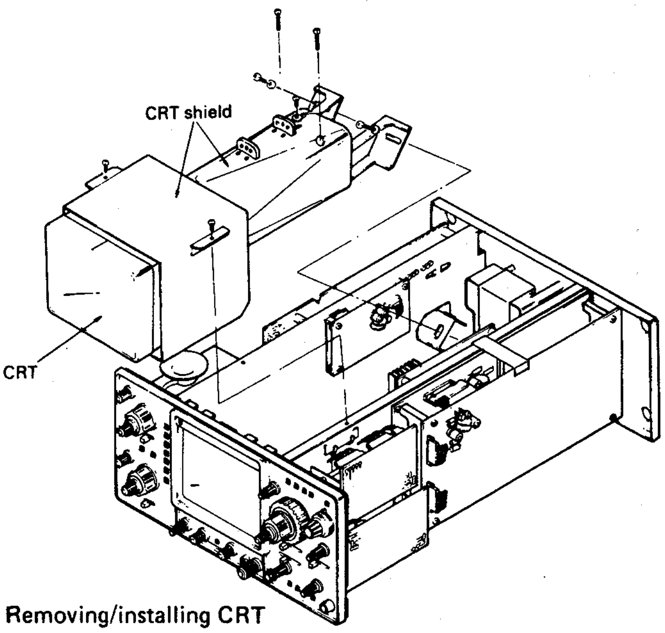
CAUTION:
A voltage of 12 kV is applied to the CRT socket and anode cap. Before removing the case, turn the power off and pull out the power plug. After removing the case, take care not to touch them.



REMOVING/INSTALLING CRT

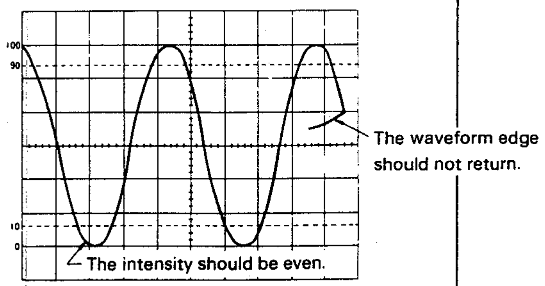
1. When servicing CRT, do not loosen the CRT band. Only remove the CRT retaining screws, then slide the CRT backward and raise the socket. The CRT can be removed easily.
2. Insert the CRT from the socket side until the CRT comes in contact with the shield plate and tighten the CRT band retaining screws.
3. As slots are provided in the CRT bracket, the CRT can be moved right and left, and back and force.
   As the bracket is inclined by 45°, the CRT can be positioned in an arbitrary position. To fix the CRT, fix the CRT band, then fix the bracket.

CAUTION:
A high tension voltage is remained at the anode of the CRT. Before removing the CRT, connect the anode to the ground via a 100 kΩ load for 5 seconds to discharge the voltage.



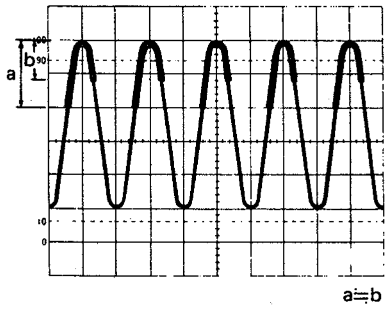
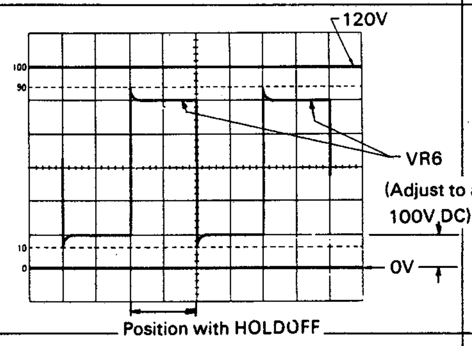
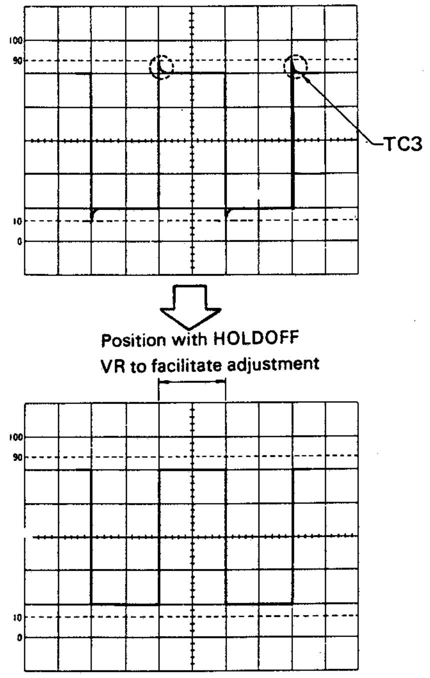
Removing/installing CRT

ADJUSTMENT

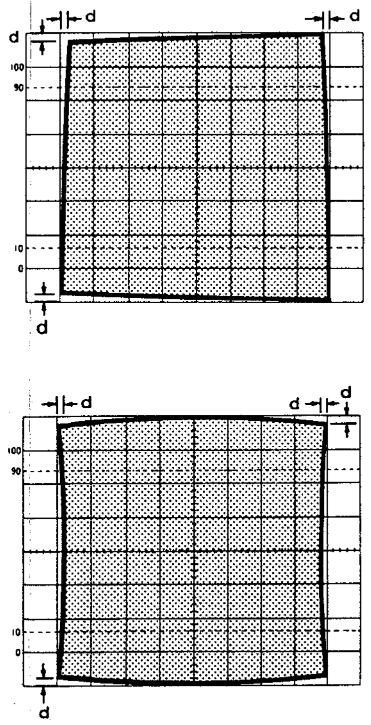
<table>
<tr><th>Item</th><th>Adjustment Control</th><th>P.C.B No.</th><th>Test Equipment</th><th>Control Setting</th><th>Adjustment and Check</th><th>Illustration</th><th>Remark</th></tr>
<tr><td colspan="8">ADJUSTMENT OF POWER SUPPLY AND CRT</td></tr>
<tr><td>Checking of Power Supply</td><td></td><td>X68-1310</td><td>475A
DL-720</td><td></td><td>(1) Measurement and checking of voltages at P27 and P30 pins
<table>
<tr><th></th><th>1P</th><th>2P</th><th>3P</th><th>4P</th><th>5P</th><th>6P</th><th>7P</th><th>8P</th></tr>
<tr><td>P27</td><td>+120V</td><td>+55±1V</td><td>20V</td><td></td><td></td><td>+5.2V</td><td>+10V</td><td>−10V</td></tr>
<tr><td>P30</td><td>24V±2V</td><td>55V</td><td></td><td>130V ±3V</td><td>7V±0.5V</td><td>12V +1.5V−0.5V</td><td>−12V +0.5V−1.5V</td><td></td></tr>
</table></td><td></td><td></td></tr>
<tr><td>Adjustment of 1.6kV</td><td>VR7</td><td>X68-1310</td><td>DL-720 High voltage probe</td><td></td><td>(2) Measure the voltage on 2P of P33 and adjust VR7 to obtain 1.6kV.</td><td></td><td></td></tr>
<tr><td>Coarse adjustment of ASTIG and FOCUS</td><td>VR9
FOCUS Knob</td><td>X68-1310</td><td></td><td>H. DISPLAY: X-Y
CH1, CH2 AC-GND-DC: GND
A INTENSITY: 3 o'clock
20 MHz B.W: ON</td><td>(1) Operate ↕ POSITION knobs for CH1 and CH2 to position the spot in the center of the CRT screen.
(2) Adjust VR9 to make the spot round and smaller.</td><td></td><td></td></tr>
<tr><td>Adjustment of A INTENSITY</td><td>VR5</td><td>X68-1310</td><td></td><td>H.DISPLAY: X-Y
A. INTENSITY: 9 o'clock
CH1, CH2 AC-GND-DC: GND
20 MHz B.W: ON</td><td>Adjust VR5 so that the spot on the CRT screen disappears when A INTENSITY is set in the position of 9 o'clock.
<Check>
(1) Make sure that the spot on the CRT screen increases in brightness when A INTENSITY is turned CW and that the trace becomes almost extinguished when A INTENSITY is turned CCW (9 o'ckock position).</td><td></td><td></td></tr>
<tr><td>Checking of B INTENSITY</td><td></td><td></td><td></td><td>H. DISPLAY: ALT
V. MODE: CH1
TRIG. MODE: AUTO
B TRIG. SOURCE: STARTS AFTER DELAY
CH1, AC-GND-DC: AC
B SWEEP TIME/DIV: 0.1ms</td><td>(1) Operate ↕ TRACE SEP to cause B sweep line in the center of the CRT screen.
(2) Make adjust so that the trace becomes extinguished when B INTENSITY is turned to fully CCW.
when B INTENSITY is turned CCW.
(3) Make adjust so that the trace becomes extinguished when B INTENSITY is turned to fully CCW.</td><td></td><td></td></tr>
<tr><td>Adjustment of Blanking</td><td>TC2</td><td>X68-1310</td><td>SG-502</td><td>H.DISPLAY: A
V.MODE: CH1
TRIG. MODE: AUTO
A TRIG SOURCE: V.MODE
A COUPLING: AC
A INTENSITY: Fully CW
CH1. AC-GND-DC: AC
A SWEEP TIME/DIV: 0.05μs</td><td>(1) Apply a sine wave signal of 10 MHz to CH1 INPUT and operate ↕ POSITION, ◂▸ POSITION and CH1 VOLTS/DIV to bring out a waveform with a vertical amplitude of 6 div on the screen.
(2) Make adjustment so that there is no unevenness in intensity of the trace at the waveform starting point and there is no retrace.</td><td>
100
90
10
0
The waveform edge should not return.
The intensity should be even.

</td><td></td></tr>
<tr><td>Adjustment of Z-axis Input Blanking</td><td>TC1</td><td>X68-1310</td><td>SG-503</td><td>H. DISPLAY: A
V. MODE: CH1 :
TRIG. MODE: AUTO
A. TRIG SOURCE: V. MODE
CH1 AC-GND-DC: DC
VOLTS/DIV: 2V</td><td>(1) Set A SWEEP TIME/DIV at 5μs and apply a 1MHz sine wave signal of 10Vp-p to CH1 INPUT so that a waveform with a vertical amplitude of 5 div appears on the screen.
(2) Apply the same signal above to the Z INPUT, and turn A INTENSITY CCW so that the dark and bright area of the waveform are distinct.
(3) Adjust so that the bright area of the sine waveform is symmetrical to the peak point.</td><td></td><td></td></tr>
</table>

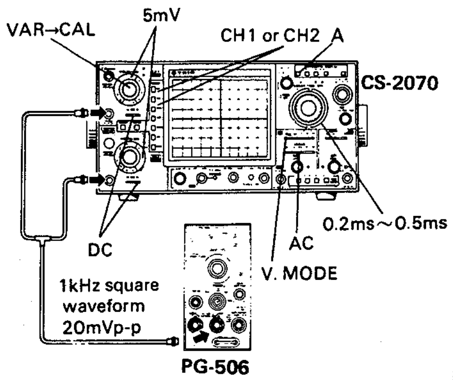
ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
							
Adjustment of Auto FOCUS Level	VR6	X68-1310	475A Probe (1/10)	H. DISPLAY: A A. INTENSITY: Fully CW TRIG. MODE: AUTO V. MODE: CH1: A. TRIG SOURCE: V. MODE A. SWEEP TIME/DIV: 20μs HOLDOFF: NORM	(1) Set the oscilloscope (475A) for the vertical axis sensitivity at 2V/div. (2) Observe the waveform of AUTO FOCUS circuit (F.TP pattern) with a probe and make adjustment so that DC level of top of the square wave is approx. 100V (4.5~5 div.)	 120V VR6 (Adjust to approx. 100V DC) 0V Position with HOLDOFF VR to facilitate adjustment.	< **Note** > Be sure that the AC-GND-DC selector switch of the oscilloscope (475A) is at "DC" position.
Adjustment of Auto FOCUS wave Forming	TC3	X68-1310		H. DISPLAY: A A INTENSITY: Fully CW TRIG MODE: AUTO V. MODE: CH1 A. TRIG SOURCE: V.MODE A SWEEP TIME/DIV: 20μs HOLDOFF: NORM	Make adjustment so that the above-mentioned circuit has an ideal waveform.		
Adjustment of ASTIG and FOCUS	VR9 FOCUS knob	X68-1310		H. DISPLAY: X-Y CH1, CH2 AC-GND-DC: GND A. INTENSITY: 3 o'clock	(1) Operate ⇕ POSITION for CH1 and CH2 so that the bright spot is brought into the center of the CRT screen. (2) Make adjustment to make the spot round and smaller. < **Check** > (1) Make sure that the bright spot grows larger when the FOCUS knob is turned CW or CCW. (2) Make sure that the FOCUS knob is in a position within the range of 9 and 3 o'clock when the spot is smallest. (3) The most ideal point should be obtained by repeating the above operations and adjustment.		< **Note** > Be sure to bring the bright spot into the center of the CRT screen. It may be difficult to obtain the correct adjusting position near the edge of the screen due to the CRT peripheral blur.

ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of Trace Rotation	VR2	X68-1310		H.DISPLAY: A V. MODE: CH1 TRIG. MODE: AUTO CH1, AC-GND-DC: GND	(1) Operate ↕ POSITION for CH1 to move the trace to the center of the CRT screen. (2) Make adjustment to align the trace with the horizontal center graticule line. **<Check>** (1) Make sure that the trace moves more than 0.3 div (10°) up and down from the horizontal center graticule line at its righthand end.		**<Note>** When the trace does not appear fully across the screen, make proper adjustment by operating VR9 (X74-1320) and VR7 (X74-1320)
Adjustment of Perpendicularity	VR3	X68-1310	SG-502	H. DISPLAY: X-Y CH1, CH2 AC-GND-DC: AC	(1) Apply a 1 kHz sine wave to CH1 INPUT and adjust the oscillator (SG-502) output to produce a waveform with a vertical amplitude of 8 div. (2) Operate ↕ POSITION knobs for CH1 and CH2 to produce a trace in the center of the CRT screen. (3) Make adjustment so that the trace is vertical (within 90° ±1°) **<Check>** Make sure that the trace moves more than 0.1 div left and right at the topmost end of the vertical center graticule line. Readjust the trace rotation.		
Adjustment of Pattern Distortion	VR10	X68-1310	SG-502	H.DISPLAY: X-Y CH1, CH2 AC-GND-DC: AC	(1) Apply a sine wave signal of 100 kHz to CH1 INPUT and a sine wave signal of 1 kHz to CH2 INPUT and adjust the oscillator output to produce a square with the sides of 8 div on the CRT screen. (2) Adjust VR10 so that the horizontal and vertical bendings are less than 0.2 div.	 d d d 100 90 10 0 d d d d 100 90 10 0 d d= 0.2div. or less	

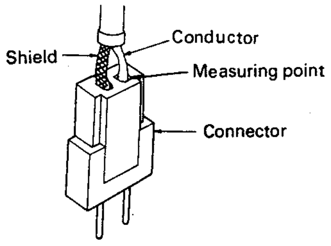
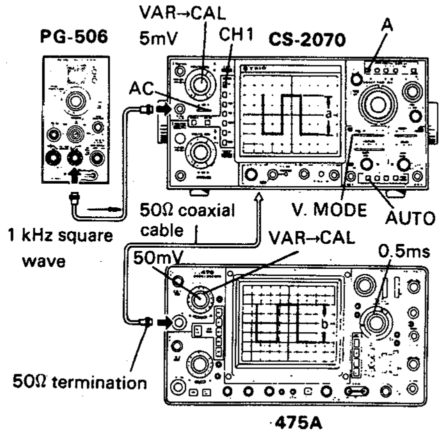
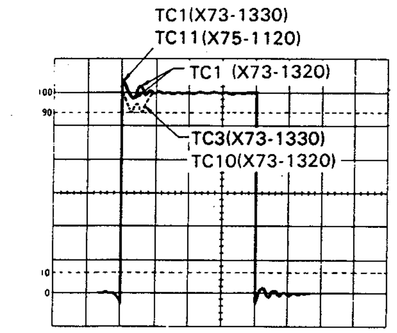
ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of CRT Center	VR1	X73-1330		H. DISPLAY: A V. MODE: CH1 TRIG. MODE: AUTO CH1. AC-GND-DC: GND	Short-circuit the test point of X73-1320 and adjust VR1 so that the trace becomes aligned with the horizontal center graticule line.		
ADJUSTMENT OF VERTICAL AXIS (I)							
Adjustment of CH1 DC BAL	VR1	X75-1120		H. DISPLAY: A V. MODE: CH1 TRIG. MODE: AUTO CH1. AC-GND-DC: GND CH1. VOLTS/DIV: 5mV	(1) Turn CH1 VARIABLE knob to fully CCW. (2) Adjust CH1 ↕ POSITION so that the trace becomes aligned with the horizontal center graticule line on the CRT screen. (3) Turn VARIABLE to CAL and make adjustment so that the trace becomes aligned with the horizontal center graticule line on the CRT screen. (4) Repeat the above procedure. **< Check >** Movement of trace | Less than 0.8 div.		**< Note >** If the trace does not come to the center of the screen even when ↕ POSITION is operated, adjust VR4 (X73-1320).
Adjustment of CH2 DC BAL	VR2	X75-1120		H. DISPLAY: A V. MODE: CH2 TRIG. MODE: AUTO CH2, AC-GND-DC: GND CH2, VOLTS/DIV: 5 mV	Same with the adjustment of CH1 DC BAL		**< Note >** CH2 position center can be adjusted by VR14 (X73-1-320).
Adjustment of CH1 Gain	VR3	X73-1320	BNC-BNC cord T junction PG-506 50Ω Termination	H. DISPLAY: A V. MODE: CH1 TRIG. MODE: AUTO A. TRIG SOURCE: V.MODE CH1, AC-GND-DC: DC CH1, VOLTS/DIV: 5mV V. VAR: CAL 20 MHz B.W: ON	(1) Apply a square wave signal of 20 mVp-p, 1 kHz to CH1 and CH2 INPUT. (2) V. MODE select to CH1 and operate CH1 and CH2 ↕ POSITION to produce a waveform in the center of the CRT screen. (3) Synchronize by operating A TRIG LEVEL. (4) Adjust VR3 so that the vertical amplitude of the waveform becomes 4 div. **< Check >** Turn CH1 VOLTS/DIV and input a reference signal so that the vertical amplitude will be 4 to 6 div in each range. Sensitivity error | within ±3%	 VAR→CAL 5mV CH1 or CH2 A CS-2070 0.2ms~0.5ms DC AC V. MODE 1kHz square waveform 20mVp-p PG-506	**< Refrence >** Method of calculation of sensitivity error Sensitivity error $= \frac{a-b}{b} \times 100\%$ a = CRT screen amplitude b = Input signal voltage /(VOLTS/DIV) (Example): CRT screen amplitude: 4.2 div Input signal: 20mVp-p 1 kHz square wave VOLTS/DIV: 5mV Sensitivity error $= \frac{4.2\text{ div} - 20\text{mV}/5\text{mV}}{20\text{mV}/5\text{mV}} \times 100 = 5\%$
Adjustment of CH2 Gain	VR13	X73-1320		H. DISPLAY: A V. MODE: CH2 TRIG MODE: AUTO A TRIG SOURCE: V.MODE CH2 AC-GND-DC: DC CH2 VOLTS/DIV: 5mV V. VAR: CAL 20 MHz B.W: ON	(1) With V. MODE selected to CH2, turn VOLTS/DIV to 5mV and perform the same operations as described above to make adjustment and check. **< Check >** (1) Select V. MODE to DUAL and ALT position and turn VOLTS/DIV for CH1 and CH2 and apply a square wave of 20mVp-p, 1 kHz to CH1 INPUT. Make sure that CH1 and CH2 have the same amplitude.		**< Note >** Overshoot or tilt might appear to the reference signal of 1 kHz square wave. In this case, make corase adjustment of square wave characteristics.

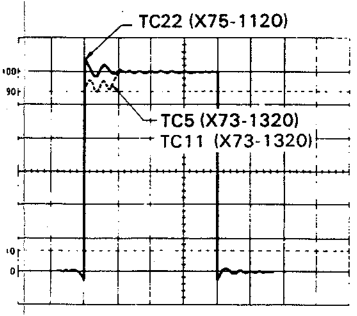
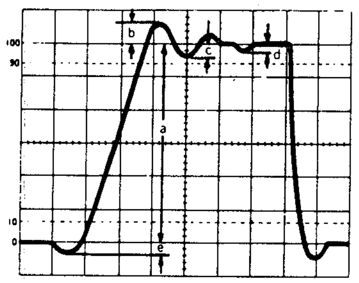
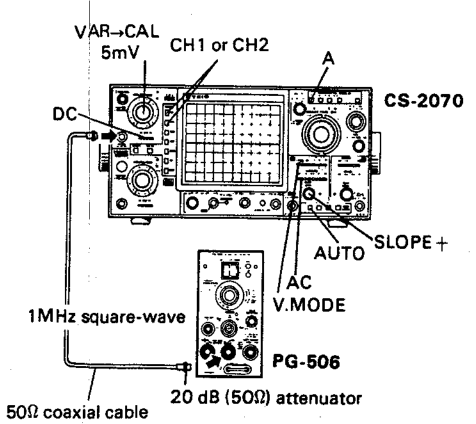
ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
					(2) Switch V. MODE to ADD and A. TRIG SOURCE to CH1 (CH2) and press CH2 INV pushbutton switch (the lamp will go on when this switch is pressed and it will go off when pressed again). Operate ↕ POSITION for CH1 and CH2 to produce a single trace in the center of the CRT screen. If a single and straight trace cannot be obtained, adjust VR3 again. Channel error: Within 3%		
Adjustment of CH1 ↕ POSITION and CH2 ↕ POSITION	VR4 VR14	X73-1320 X73-1320		V. MODE: DUAL, ALT H.DISPLAY: A TRIG.MODE: AUTO CH1, CH2 VOLTS/DIV: 5mV CH1, CH2 AC-GND-DC:GND CH1, CH2 ↕ POSITION: 12 o'clock A SWEEP TIME/DIV: 0.1ms	Adjust VR4 and VR14 so that the CH1 and CH2 traces become aligned with the horizontal center graticule line on the CRT screen. **< Check >** (1) The deviation from the horizontal center graticule line on the CRT screen must be within ±1 div. (2) When ↕ POSITION for both CH1 and CH2 is turned fully CW, the trace must move upward more than 4 div and when the knob is turned fully CCW the trace must move downward more than 4 div.		
Adjustment of CH2 INV Position	VR15	X73-1320			Press CH2 INV (the lamp is on) and adjust VR15 to bring the trace to its position at CH2 NORM (the lamp is off). **< Check >** (1) Vertical deviation between CH2 NORM and INV : within ±0.5 div (2) Press CH2 INV and turn CH2 ↕ POSITION fully CW and see if the trace moves more than 4 div upward and it moves more than 4 div downward when the knob is turned fully CCW.		
Adjustment of CH1 X5 Gain and CH2 X5 Gain	VR6 VR17	X73-1320 X73-1320	PG-506	H. DISPLAY: A V. MODE: DUAL, ALT TRIG.MODE: AUTO CH1,CH2 VOLTS/DIV:5mV CH1, CH2 AC-GND-DC: DC CH1,CH2 X5 GAIN: PULL A SWEEP TIME/DIV: 0.2ms V.VAR: CAL	(1) Apply a square wave signal of 5 mVp-p to CH1 INPUT and make adjustment so that the CRT screen amplitude becomes 5 div. (2) Apply the same signal to CH2 and make the similar adjustment. **< Check >** (1) The sensitivity error must be within ±3%. (2) For both CH1 and CH2, the lamp must go on when PULL X5 GAIN is pulled and go off when the button is pressed. (3) The UNCAL lamp must go off when VARIABLE is operated to CAL and go on when the knob is turned to UNCAL. (CCW)		**< Note >** If no waveform appears on the screen when the knob is pulled, make coarse adjustment by operating X5 Gain Position Adjustment. CH1: VR5 (X73-1320) CH2: VR16 (X73-1320)
Adjustment of CH1 X 5 Gain Position andCH2 X 5 Gain Position	VR5 VR16	X73-1320 X73-1320		H. DISPLAY: A V. MODE: DUAL, ALT TRIG. MODE: AUTO CH1,CH2 VOLTS/DIV:5mV CH1,CH2 AC-GND-DC:GND CH1,CH2 X5 GAIN: PULL CH1,CH2 ↕ POSITION: 12 o'clock A SWEEP TIME/DIV: 0.1ms	Adjust VR5 and VR16 so that the trace of CH1 and CH2 become aligned with the horizontal center graticule line on the CRT screen. **< Check >** The distance from the center graticule line must be within ±1 div.		**< Note >** If sometimes happens that the trace grows thicker at X5 GAIN, thus making it difficult to obtain proper adjustment. In this case, press 20 MHz BW (the lamp is on) button switch to make the line thinner.

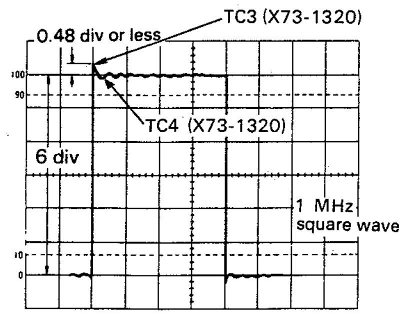
ADJUSTMENT

<table>
<tr><th>Item</th><th>Adjustment Control</th><th>P.C.B No.</th><th>Test Equipment</th><th>Control Setting</th><th>Adjustment and Check</th><th>Illustration</th><th>Remark</th></tr>
<tr>
<td>Adjustment of
CH1 DC Trig Level
CH2 DC Trig Level
CH3 DC Trig Level
CH4 DC Trig Level</td>
<td>VR7
VR19
VR10
VR20</td>
<td>X73-1320
X73-1320
X73-1320
X73-1320</td>
<td>DL-720</td>
<td>H. DISPLAY: A
V. MODE: QUAD
CH1, CH2 AC-GND-DC: GND
TRIG. MODE: AUTO</td>
<td>(1) Operate CH1 and CH2 ⇕ POSITION and CH3 and CH4 ⇕ POSITION to align the trace with each other on the center of the CRT screen.
(2) Make adjustment so that the voltage at all the check points may be zero (−0.008∼ +0.008V).
<table>
<tr><th>Item of Adj.</th><th>Adj. Control</th><th>Check point</th></tr>
<tr><td>CH1 DC Trig Level</td><td>VR7</td><td>P15 (X73-1320)</td></tr>
<tr><td>CH2 DC Trig Level</td><td>VR19</td><td>P16 (X73-1320)</td></tr>
<tr><td>CH3 DC Trig Level</td><td>VR10</td><td>P17 (X73-1320)</td></tr>
<tr><td>CH4 DC Trig Level</td><td>VR20</td><td>P18 (X73-1320)</td></tr>
</table></td>
<td> </td>
<td><Note>
Use the connector lead for making measurement at the check points.
Adjust the voltage in the conductor to zero.</td>
</tr>
<tr>
<td>Adjustment of
V. MODE Trig DC Level</td>
<td>VR22</td>
<td>X73-1320</td>
<td></td>
<td>V. MODE: CH1
CH1, AC-GND-DC: GND</td>
<td>(1) Operate CH1 ⇕ POSITION to align the trace with horizontal center graticule line on the CRT screen.
(2) Make adjustment so that the voltage in the conductor of the connector P19 is zero (−0.008 ∼ +0.008V).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment of CH1
OUT Gain</td>
<td>VR8</td>
<td>X73-1320</td>
<td>475A
50Ω Termination
50Ω coaxial cable
PG-506</td>
<td>H.DISPLAY: A
V. MODE: CH1
TRIG MODE: AUTO
CH1 AC-GND-DC: AC
CH1 VOLTS/DIV: 5mV
V. VAR: CAL</td>
<td>(1) Set the vertical axis sensitivity of oscilloscope (475A) to 50mV and AC-GND-DC to DC.
(2) Connect the cable to CH1 OUT on the rear panel of CS-2070 and oscilloscope (475A) via the 50Ω termination.
(3) Apply a 1 kHz square wave signal to CH1 INPUT and adjust the oscillator output and ⇕ POSITION so that the amplitude may be 2 div upward and downward from the horizontal center graticule line on the CRT screen.
(4) Make adjustment so that the oscilloscope (475A) waveform becomes 4 div.</td>
<td>
475A
a=b=4 div.</td>
<td></td>
</tr>
<tr>
<td>Adjustment of
CH1 OUT DC Level</td>
<td>VR9</td>
<td>X73-1320</td>
<td>DL-720</td>
<td>H.DISPLAY: A
V. MODE: CH1
CH1 AC-GND-DC: GND
TRIG. MODE: AUTO</td>
<td>(1) Operate CH1 ⇕ POSITION to align the trace with the horizontal center graticule line on the CRT screen.
(2) Make adjustment so that the voltage in the connector P21 (X73−1320) becomes less than 0V (±10mV).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment of
Square wave Charactaristics of CH1 5mV and 0.5V Ranges</td>
<td>TC3
TC1
TC10
TC11
TC1
TC9
TC7
TC23</td>
<td>X73-1330
X73-1320
X73-1320
X75-1120
X73-1330
X73-1320
X75-1120
X75-1120</td>
<td>PG-506
50Ω 20dB Attenuator
50Ω coaxial cable (BNC-BNC)
475A
50Ω Termination</td>
<td>H. DISPLAY: A
TRIG MODE: AUTO
CH1, CH2 AC-GND-DC:DC
CH1, CH2 VOLTS/DIV:5mV
ATRIG SOURCE: CH1
COUPLING: AC
A TRIG SLOPE: +
V VAR: CAL</td>
<td>(1) Set V. MODE to CH1 and repeatedly apply a 1 MHz squarewave signal to CH1 INPUT from the squarewave oscillator and adjust the oscillator output so that the amplitude becomes 6 div. In doing this, the input terminal must be terminated to match the output impedance of the oscillator, when the output impedance is 50Ω termination.
(2) Adjust TC3, TC1, TC10, TC11 and TC1 to shape the square wave on the CRT screen (CS-2070) as illustrated at right.
At the sametime, adjust TC9 to shape the square wave on the CRT screen of 475A.
(3) Rotate VOLTS/DIV to 0.5V and adjust TC7 and TC23 so that the quality of square waveform becomes the best.</td>
<td> </td>
<td>(1) Adjust A SWEEP TIME/DIV between 0.05 μs and 0.2 μs so that the waveform is visible.
(2) As all measuring instruments are affected, repeat the adjustment individually.</td>
</tr>
</table>

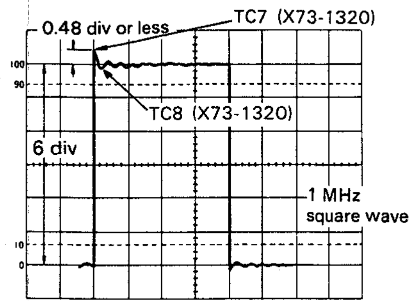
ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of Square wave Characteristics of CH2 5mV and 0.5V Ranges	TC5 TC22 TC11 TC18 TC24	X73-1320 X75-1120 X73-1320 X75-1120 X75-1120	PG-506 50Ω 20dB Attenuator 50Ω coaxial cable (BNC-BNC) 475A 50Ω Termination	A TRIG SOURCE: CH2	(1) Set V. MODE to CH2 and make adjustment to obtain the same waveform as in the case of CH1. (2) Rotate the VOLTS/DIV to 0.5V and adjust TC18 and TC24 to obtain the square waveform as in the case of CH1. < **Check** > (1) With VOLTS/DIV remaining at 5mV, check the waveform quality when A. SWEEP TIME/DIV is changed by varying the squarewave frequency, from 100kHz to 10kHz, 1kHz and back to 100Hz sequentially. Overshoot | Less than 8%	  a=6 div c=Ringing e=Pre-shoot b=Overshoot d=Hall	
Adjustment of Square wave Characteristics of CH1 X5 GAIN	TC2	X73-1320	PG-506 50Ω Termination 50Ω, 20dB Attenuator 50Ω coaxial cable (BNC-BNC)	H. DISPLAY: A TRIG MODE: AUTO CH1, CH2 AC-GND-DC: DC CH1, CH2 VOLTS/DIV: 5mV A TRIG SOURCE: CH1 COUPLING: AC A TRIG SLOPE: + V. VAR: CAL	(1) With V. MODE being set to CH1, pull the PULL X5 GAIN and apply 1 MHz squarewave signal to CH1 INPUT to produce a waveform quality of 6 div on the CRT screen. (2) Make adjustment to improve the waveform quality < **Check** > Overshoot | less than 8%.	 VAR→CAL 5mV CH1 or CH2 A CS-2070 DC SLOPE + AUTO AC V.MODE 1MHz square-wave PG-506 20 dB (50Ω) attenuator 50Ω coaxial cable	< **Note** > Terminate the input terminal of oscilloscope to match the output impedance of the oscillator.
Adjustment of Square wave Characteristics of CH2 X5 GAIN	TC6	X73-1320		A TRIG SOURCE: CH2	(1) With V. MODE set to CH2, apply 1 MHz square wave signal to CH2 INPUT and make the same adjustment as in the case of CH1. < **Check** > Overshoot | less than 8%.		

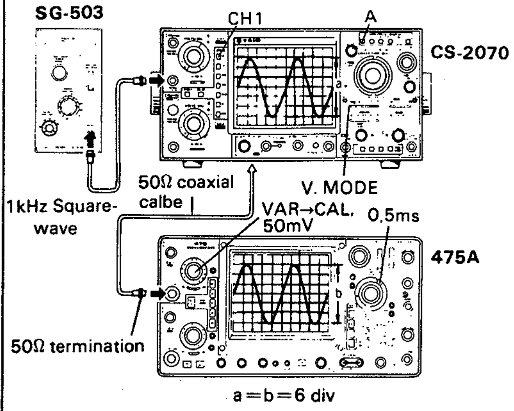
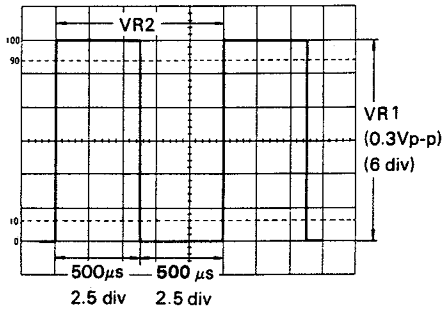
ADJUSTMENT

<table>
<tr><th>Item</th><th>Adjustment Control</th><th>P.C.B No.</th><th>Test Equipment</th><th>Control Setting</th><th>Adjustment and Check</th><th>Illustration</th><th>Remark</th></tr>
<tr>
<td>Adjustment of
CH1 ATT
CH2 ATT</td>
<td></td>
<td>X75-1120</td>
<td>4343B
PG-506</td>
<td>H.DISPLAY: A
CH1 AC-GND-DC: DC
A TRIG SOURCE: V. MODE
A SWEEP TIME/DIV: 0.2ms
V.VAR: CAL</td>
<td>(1) Shaping of waveform
Apply 1 kHz squarewave signal to CH1 and CH2 INPUT and adjust the oscillator output to produce a waveform of 5~6 div. In doing this, make adjustment so that the waveform quality of each range is equal to that of the 5mV range.
(2) Input capacity
Connect a Q-meter (4343B) to CH1 and CH2 INPUT and make adjustment so that the input capacity of each range is equal to that of the 5mV range.
CH1 Reference range: 5mV Range
<table>
<tr><th>Seque-nce</th><th colspan="2">Adjustment</th><th>Adj. control</th></tr>
<tr><td>1</td><td>10mV range</td><td>Wave Shape</td><td>TC4</td></tr>
<tr><td>2</td><td>20mV range</td><td>Wave Shape</td><td>TC5</td></tr>
<tr><td>3</td><td>50mV range</td><td>Wave Shape</td><td>TC6</td></tr>
<tr><td>4</td><td>0.5V range</td><td>Wave Shape</td><td>TC10</td></tr>
<tr><td>5</td><td>10mV range</td><td>Input Capacity</td><td>TC1</td></tr>
<tr><td>6</td><td>20mV range</td><td>Input Capacity</td><td>TC2</td></tr>
<tr><td>7</td><td>50mV range</td><td>Input Capacity</td><td>TC3</td></tr>
<tr><td>8</td><td>0.5V range</td><td>Input Capacity</td><td>TC8</td></tr>
</table>
CH2 Reference range: 5mV Range
<table>
<tr><th>Seque-nce</th><th colspan="2">Adjustment</th><th>Adj. control</th></tr>
<tr><td>1</td><td>10mV range</td><td>Wave Shape</td><td>TC15</td></tr>
<tr><td>2</td><td>20mV range</td><td>Wave Shape</td><td>TC16</td></tr>
<tr><td>3</td><td>50mV range</td><td>Wave Shape</td><td>TC17</td></tr>
<tr><td>4</td><td>0.5V range</td><td>Wave Shape</td><td>TC21</td></tr>
<tr><td>5</td><td>10mV range</td><td>Input Capacity</td><td>TC12</td></tr>
<tr><td>6</td><td>20mV range</td><td>Input Capcity</td><td>TC13</td></tr>
<tr><td>7</td><td>50mV range</td><td>Input Capacity</td><td>TC14</td></tr>
<tr><td>8</td><td>0.5V range</td><td>Input Capacity</td><td>TC19</td></tr>
</table>
</td>
<td></td>
<td><Note>
(1) Be sure to make the adjustment with the shield case being fitted in place.
(2) If smearing or overshoot occurs to the square wave at 0.1V or 0.2V range, at 0.1V range, adjust TC1 (CH1) or TC12 (CH2) and at 0.2V range, TC2 (CH1) or TC13 (CH2).
* Input capacity should be in the specification.</td>
</tr>
<tr><td colspan="8">ADJUSTMENT OF A, B TRIG AMPLIFIERS</td></tr>
<tr>
<td>Adjustment of
CH3 Gain and
CH4 Gain</td>
<td>VR11
VR21</td>
<td>X73-1320
X73-1320</td>
<td>PG506</td>
<td>H.DISPLAY: A
V.MODE: QUAD. ALT
A TRIG SOURCE: EXT CH3
B TRIG SOURCE: EXT CH4
A SWEEP TIME/DIV: 0.2ms
TRIG MODE: AUTO
CH1, CH2 AC-GND-DC: GND</td>
<td>(1) Apply a 1 kHz squarewave signal simultaneously to CH3 and CH4 INPUT and adjust A TRIG LEVEL and B TRIG LEVEL to obtain synchronization. Operate CH3 and CH4 POSITION to bring the pattern to the center of the CRT screen.
(2) Make adjustment so that the amplitude of CH3 and CH4 becomes 5 div., respectively.
<Check>
Sensitivity error must be within ±3%. (See to Reference for the adjustment of CH1 Gain)
<table><tr><td>Sensitivity error</td><td>within ±3%.</td></tr></table>
</td>
<td></td>
<td><Note>
If tilt or overshoot occurs to the 1 kHz waveform, refer to the section devoted to CH3 and CH4 waveform shaping.</td>
</tr>
<tr>
<td>CH3 Waveform Shaping</td>
<td>TC4(Medium range)
TC3(Ultra high range)</td>
<td>X73-1320
X73-1320</td>
<td>PG-506</td>
<td>H.DISPLAY: A
V. MODE: QUAD, ALT
A TRIG SOURCE: EXT CH3
A SWEEP TIME/DIV: 0.2ms
TRIG MODE: AUTO
CH1, CH2 AC-GND-DC: GND</td>
<td>(1) Apply a 1 kHz square wave signal of fast rise time to CH3 INPUT and adjust the oscillator output to produce a waveform of 6 div on the CRT screen.
(2) Produce a waveform of 6 div in the same manner and adjust TC3 to obtain the similar waveform as (1) above.
(3) With A. SOURSE to EXT CH3 adjust the oscillator output and frequency to produce a square waveform of 1 MHz 6 div on the CRT screen and shape the waveform in the medium and ultra-high ranges.
<Check>
<table><tr><td>Overshoot</td><td>less than 8%</td></tr></table>
</td>
<td>
</td>
<td><Note>
(1) When shapping the waveform, terminate the input terminal of oscilloscope to match the output impedance of the oscillator
(2) Before making 1 MHz waveshape, be sure to adjust input capacity EXT CH3 (TC1)</td>
</tr>
</table>

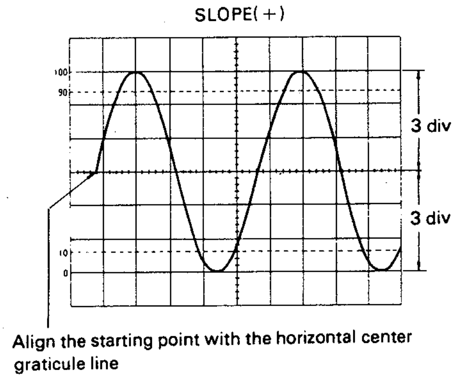
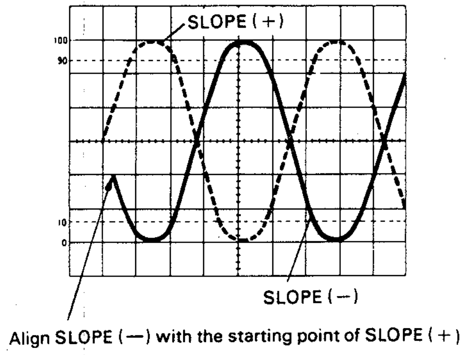
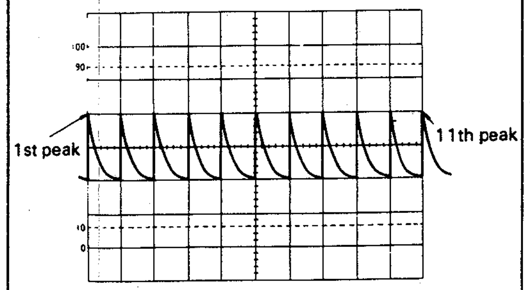
ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
CH4 Wave form Shapping	TC8(Medium range) TC7(Ultra high range)	X73-1320 X73-1320	PG-506	H.DISPLAY: A V.MODE: QUAD.ALT A TRIG SOURCE: EXT CH3 B TRIG SOURCE: EXT CH4 A SWEEP TIME/DIV: 0.2ms B SWEEP TIME/DIV: 0.2ms	(1) Apply 1kHz and 1 MHz square wave signals of fast rise time to both CH3 and CH4 INPUT and take the same steps as in (1) above to shape the waveform. **< Check >** Overshoot less than 8%.	 0.48 div or less TC7 (X73-1320) 100 90 TC8 (X73-1320) 6 div 1 MHz square wave 10 0	**< Note >** Before making 1 MHz wave shape, be sure to adjust input capacity EXT CH4 (TC4)
Adjustment of CH3 Input Capacity	TC1	X77-1130	4343B	A TRIG SOURCE: EXT CH3 B TRIG SOURCE: EXT CH4	Make adjustment so that the input capacity of CH3 becomes equal to the value of CH1 5mV range (28pF ±2pF).		**< Note >** Be sure to make adjustment of input capacity after making 1 kHz square wave waveshape.
Adjustment of CH4 Input Capacity	TC4	X77-1130			Adjust the input capacity in the same manner as CH3. **< Check >** Check the input capacity in the same manner as CH3. Overshoot less than 8%.		**< Note >** Be sure to make adjustment of input capacity after making 1 kHz square wave waveshape.
ADJUSTMENT OF VERTICAL AXIS (II)							
Check of 1 MHz Square wave Characteristics **Square wave Characteristics of CH1 and CH2**			PG-506 50Ω Termination	H.DISPLAY: A A. TRIG SOURCE: V.MODE A.SWEEP TIME/DIV: 0.2μs~0.05μs TRIG.MODE: AUTO A COUPLING: AC	(1) Check the squarewave characteristics of CH1 and CH2 5mV range. Turn the VOLTS/DIV knob for each channel to adjust the oscillator output so that CH1 and CH2 will produce a waveform of 6 div, respectively. (2) The overshoot must be less than 8% for each range.		**< Note >** As the VOLTS/DIV is manually rotated, the amplitude of 6 divs cannot be obtained amplitude.
Square wave Characteristics of CH3 and CH4				H. DISPLAY: ALT V.MODE: QUAD. ALT A.TRIG SOURCE: EXT CH3 B TRIG SOURCE: EXT CH4	Apply a 1 MHz squarewave signal to CH3 and CH4 INPUT and see if the overshoot is less than 8% at this time.		
CHeck of CH1 and CH2 Frequency Characteristics			SG-503 50Ω coaxial cable (BNC-BNC) 50Ω 20dB attenuator 50Ω Termination.	H. DISPLAY: A TRIG MODE: AUTO A. TRIG SOURCE: V. MODE A COUPLING: AC CH1, CH2 AC-GND-DC: DC A SWEEP TIME/DIV: 2μs~0.05μs	(1) With CH1 VOLTS/DIV set to 5 mV, apply a sine wave signal of 50kHz to INPUT and adjust the oscillator output to produce a waveform of 6 div on the CRT screen. (2) When the frequency is varied to 70 MHz with the oscillator output remaining unchanged, the amplitude on the screen must be over 4.25 div and there must be no sudden dips and peaks during attenuation. (3) Perform the same operations for CH2. Frequency characteristic 70MHz: less than −3 dB (4) When the specification are not satisfied, readjust the 1 MHz squarewave characteristics.		

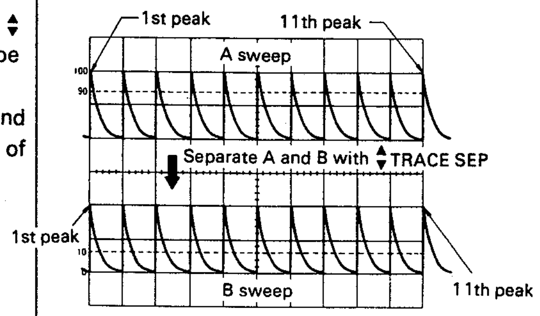
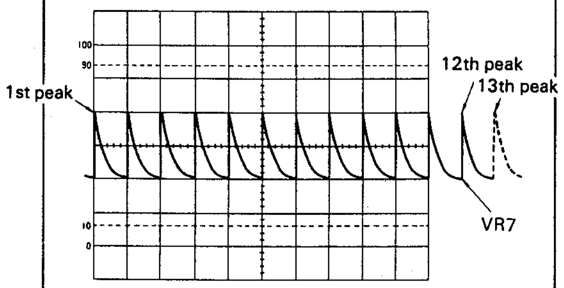
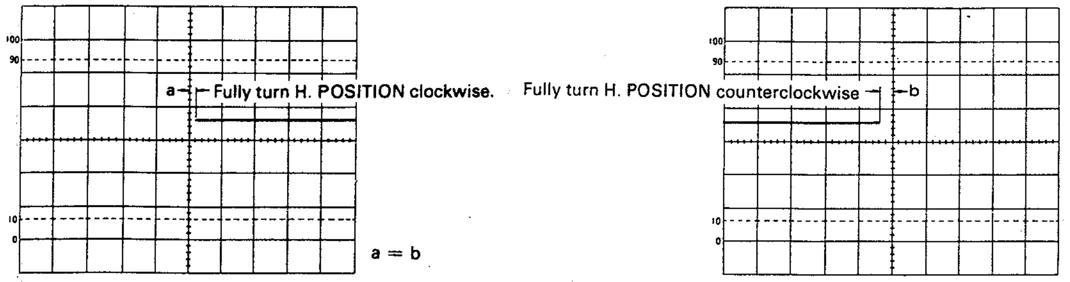
ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Check of CH3 and CH4 Frequency Characteristics			SG-503 50Ω coaxial cable (BNC-BNC) 50Ω 20dB attenuator 50Ω Termination.	H. DISPLAY: ALT V.MODE: QUAD.ALT TRIG. MODE: AUTO A TRIG SOURCE: EXT CH3 B. TRIG SOURCE: EXT CH4	(1) Apply sine wave signals of 50 kHz to both CH3 and CH4 INPUT and adjust the oscillator output to produce a waveform of 6 div on the CRT screen. (2) When the frequency is changed to 70 MHz with the oscillator output remaining unchanged, the amplitude on the screen must be over 4.25 div. Frequency characteristic 70MHz : less than −3 dB (3) Perform the same operations for CH4. (4) When the specification are not satisfied, readjust the 1 MHz squarewave characteristics.		
Check of CH1 and CH2 X5 GAIN Frequency Characteristics			SG-503 50Ω Termination	H.DISPLAY: A A TRIG SOURCE: V. MODE TRIG.MODE: AUTO CH1, CH2 AC-GND-DC: DC CH1, CH2 VOLTS/DIV: 5mV CH1, CH2 X5 GAIN: PULL	(1) With V. MODE set to CH1, apply a sine wave signal of 50 kHz to CH1 INPUT and adjust the oscillator output to produce a waveform of 6 div on the CRT screen. (2) When the frequency is varied to 70MHz with the oscillator output remaining unchanged, the amplitude on the screen must be over 4.25 div. (3) Set V. MODE to CH2 and make a similar check. X5 GAIN frequency characteristic 70MHz: less than −3 dB.		
Check of 20MHz BW Frequency Characteristics			SG-503 50Ω Termination	H.DISPLAY: A V.MODE: CH1 A TRIG SOURCE: V.MODE CH1 AC-GND-DC: DC CH1 VOLTS/DIV: 5mV 20MHz BW: ON TRIG MODE: AUTO	(1) Apply a sine wave signal of 50kHz to CH1 INPUT to produce a waveform of 6 div. (2) Vary the frequency of the input signal without changing the oscillator output and read the frequency at which the amplitude on the screen becomes 4.25 div. This frequency must be within the specification limits. 20MHz BW Frequency characteristics Frequency of −3 dB:16 MHz−24 MHz.		
Adjustment of CH1 OUT Frequency Characteristics	TC9	X73-1320	475A 50Ω Termination (through type) 50Ω coaxial cord (BNC-BNC) SG-503	CH1 AC-GND-DC: AC CH1 VOLTS/DIV: 5mV CH1 ⇕ POSITION: 12 o'clock	(1) With the vertical axis sensitivity of 475A set to 50mV, lead a 50Ω coaxial cable from CH1 OUT and terminate it with 50Ω termination and connect it to CH1 OUT of 475A. (2) Apply a sine wave signal of 50kHz to CH1 INPUT and adjust the oscillator output so that the vertical amplitude of 475A becomes 6 div. When the frequency is varied to 70 MHz without changing the oscillator output, adjust TC9 so that the amplitude on the CRT screen of 475A becomes over 4.25 div. CH1 OUT frequency characteristic 70MHz: less than −3 dB	 SG-503 CH1 A CS-2070 a 50Ω coaxial calbe V. MODE 1kHz Square-wave VAR→CAL. 50mV 0.5ms 475A b 50Ω termination a=b=6 div	< **Note** > If the squarewave characteristics of CH1 PREAMP and V OUTPUT AMP are readjusted the squarewave characteristic and frequency characteristic will also change.
Adjustment of CAL Output	VR1 VR2	X77-1130 X77-1130	475A FC-754A DL-720		(1) Short-circuit TP2 (X77−1130) and adjust VR1 so that the voltage at CAL output terminal becomes 0.3V ±1%. (2) Set the vertical axis sensitivity of 475A to 5mV and the sweep time to 0.2 ms. (3) Lead a probe from the calibration voltage output terminal (CAL) of CS-2070 and connect it to CH1 INPUT of 475A. (4) Adjust VR2 so that the frequency becomes 1 kHz. < **Check** > Check the duty ratio. Frequency: Within 1 kHz ±3%. Output voltage: Within 0.3 Vp-p ±1%. Dudy ratio: Within (50 ±2)%	 VR2 100 90 10 0 VR1 (0.3Vp-p) (6 div) 500μs 500 μs 2.5 div 2.5 div	< **Note** > For checking the frequency, a frequency counter (FC-754A) may be used.

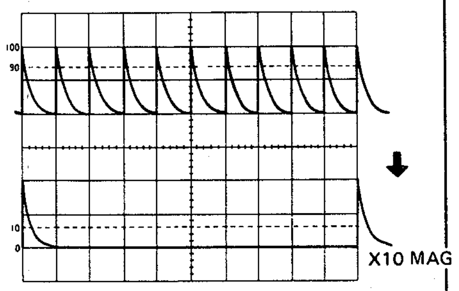
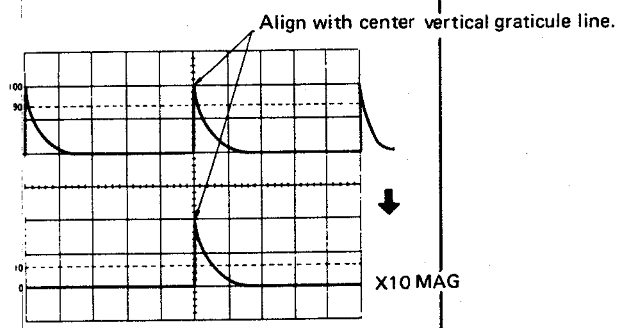
ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
ADJUSTMENT OF HORIZONTAL SWEEP							
Coarse Adjustment of A and B Trigger Center and SLOPE (Coarse Adjustment of A Trigger Center and SLOPE)	VR2 VR3	X77-1110 X77-1110	SG-502	H.DISPLAY: A V.MODE: CH1 TRIG MODE: AUTO CH1 AC-GND-DC: AC A SWEEP TIME/DIV: 0.2ms A TRIG SOURCE: V. MODE A COUPLING: AC TRIG LEVEL: 12 o'clock TRIG SLOPE: +	(1) Apply a sine wave signal of 1 kHz to CH1 INPUT and adjust the oscilloscope output and ⬍ position to produce a waveform of amplitude 3 div above and below the horizontal center graticule line on the CRT screen. (2) Adjust VR2 so that the starting point of the waveform is aligned with the horizontal center graticule line on the CRT screen. (3) Set TRIG. SLOPE to (−) and adjust VR3 to bring the starting point to the position of the starting point of the waveform produced when TRIG. SLOPE is set to (+).  Align the starting point with the horizontal center graticule line	 Align SLOPE (—) with the starting point of SLOPE (+)	
Coarse Adjustment of B Trigger Center and SLOPE	VR2 VR3	X77-1120 X77-1120	SG-502	H.DISPLAY: ALT V.MODE: CH1 A TRIG SOURCE: V. MODE B TRIG SOURCE: CH1 B TRIG LEVEL: 12 o'clock B TRIG SLOPE: + A SWEEP TIME/DIV: 0.5ms B SWEEP TIME/DIV: 0.2ms TRIG. MODE: AUTO ⬍ TRACE SEP: NORM	(1) Set A. INTEN to Fully CCW. (2) Apply a sine wave signal of 1 kHz to CH1 INPUT and adjust the oscillator output and ⬍ position to produce a waveform of amplitude 3 div above and below the horizontal center graticule line on the CRT screen. (3) Next, set TRIG. SLOPE to (−) and make adjustment to bring the starting point of the waveform to the position of the starting point of the waveform produce when TRIG. SLOPE is set to (+).		
Adjustment of A Sweep Time	VR9	X74-1320	TG-501	H.DISPLAY: A V.MODE: CH1 A TRIG SOURCE: V. MODE A SWEEP TIME/DIV: 0.5ms TRIG MODE: AUTO A. VAR: CAL	(1) Apply a marker signal of 0.5 ms to CH1 INPUT. (2) Operate ◂▸ POSITION to bring the first peak of the marker signal to the left end of the graticule line and adjust VR9 for the 11th peak to the right end of the graticule line.		<Note> When TG-501 is used, set CH1 AC-GND-DC to AC, VOLTS/DIV to 0.5V/div, thru 50Ω termination.

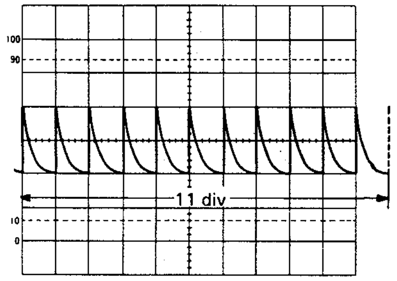
ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of B Sweep Time	VR10	X74-1320	TG-501	H.DISPLAY: ALT V.MODE: CH1 A. TRIG SOURCE: V. MODE B. TRIG SOURCE: CH1 A SWEEP TIME/DIV: 0.5ms B SWEEP TIME/DIV: 0.5ms TRIG.MODE: AUTO A,B TRIG.SLOPE: + A,B INTEN: Fully CW DELAY TIME MULTI: 0.20	(1) Apply a marker signal of 0.5 ms to CH1 INPUT. (2) On the screen A and B sweeps of CH1 input signal will appear. Operate ↕ TRACE SEP to bring these sweeps into the positions where they can be easily adjusted. (3) Make adjustment so that the first peak of B sweep is brought to the left end of the graticule line on the screen and the 11th peak to the right end of graticule line on the screen. (4) Make sure that A and B TRIG'D lamps are on.	 1st peak 11th peak A sweep 100 90 Separate A and B with ↕ TRACE SEP 1st peak 10 0 B sweep 11th peak	<Note> 1. When TG-501 is used, the knobs must be operated in the same manner as described above. 2. If the 11th peak is not visible, adjust VR7 (X74-1320) Sweep Length 3. The B sweep time will not change even if A VAR is turned.
Adjustment of A Sweep Length	VR7	X74-1320		H. DISPLAY: A V. MODE: CH1 A TRIG SOURCE: V. MODE A SWEEP TIME/DIV: 0.5 ms TRIG MODE: AUTO	(1) Apply a marker signal of 0.5 ms to CH1 INPUT. (2) Make adjustment so that the total length is 11 div.	 100 90 12th peak 13th peak 1st peak VR7 10 0	<Note> Turn ↔ POSITION to shift the base line two markers to the left then you can see the 12th time marker with the graticule area.
Adjustment of B Sweep Length	VR8	X74-1320		H. DISPLAY: ALT V. MODE: CH1 A TRIG SOURCE: V. MODE B TRIG SOURCE: CH1 A SWEEP TIME/DIV: 0.5 ms B SWEEP TIME/DIV: 0.5ms TRIG MODE: AUTO A, B TRIG SLOPE: + A, B INTEN: Fully CW DELAY TIME MULTI: 0.20	(1) Apply a marker signal of 0.5 ms to CH1 INPUT. (2) A and B sweeps will appear on the screen. Use ↕ TRACE SEP to separate them. (3) Make adjustment so that the total length of B sweep is 11 div.		
Adjustment of A Sweep Position	VR12	X74-1320		H.DISPLAY: A V. MODE: CH1 A TRIG SOURCE: V. MODE A SWEEP TIME/DIV: 0.5 ms TRIG MODE: AUTO	(1) Set CH1 AC-GND-DC to GND to bring the trace to the center of the CRT screen. (2) Set the FINE knob of ↔ POSITION to 12 o'clock. (3) Turn ↕ POSITION fully CW without turning the FINE knob and note the deviation between the starting point of the trace and the center of the screen. Next, turn ↔ POSITION fully CCW and measure the distance between the ending point of the trace and the center of the screen. Make adjustment so that these deviations will have the same width. Width error less than 1 div.  100 90 a Fully turn H. POSITION clockwise. 10 0 a = b Fully turn H. POSITION counterclockwise b 100 90 10 0		

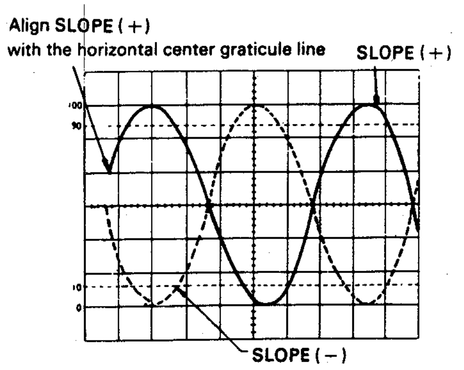
ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of B Sweep Position	VR11	X74-1320	TG-501	H.DISPLAY: ALT V.MODE: CH1 A TRIG SOURCE: V. MODE B TRIG SOURCE: CH1 A,B SWEEP TIME/DIV: 0.5ms TRIG MODE: AUTO A, B TRIG SLOPE: + A, B INTEN: Fully CW DELAY TIME MULTI: 0.20	(1) Apply a marker signal of 0.5 ms to CH1 INPUT and align the first peak of A sweep to the leftmost division of the CRT screen. (2) Operate ⬍ TRACE SEP to separate A sweep and B sweep and set A. VAR to CAL. (3) Make adjustment so that the starting point of B sweep is aligned with that of A sweep in the horizontal position. **<Check>** Operate ⬍ TRACE SEP so that A sweep and B sweep are superimposed on one another and make sure that their starting points coincide with each other.		
Adjustment of X10 MAG Gain	VR13	X74-1320	TG-501	H.DISPLAY: A V.MODE: CH1 A TRIG SOURCE: V.MODE A SWEEP TIME/DIV: 0.1ms TRIG MODE: AUTO CH1, VOLTS/DIV: 1V CH1, AC-GND-DC: DC	(1) Apply a marker signal of 0.1 ms to CH1 INPUT to produce a waveform of vertical amplitude of about 2 div. (2) Align the first peak of the marker signal with the left end of the graticule line on the CRT screen and the 11th peak with the right end and pull the X10 MAG switch. (3) Make adjustment so that the peak-to-peak distance is 10 div. **<Check>** Specification | 10 times ±5%		
Adjustment of X10 MAG Center	VR14	X74-1320		H. DISPLAY: A V. MODE: CH1 A TRIG SOURCE: V. MODE A SWEEP TIME/DIV: 0.1ms A. VAR: CAL TRIG. MODE: AUTO A, TRIG SLOPE: +	(1) Apply a marker signal of 0.5 ms to CH1 INPUT to produce 3 peaks waveform on the CRT screen. (2) Operate ◀ ▶ POSITION to bring the central peak to the vertical center graticule line on the screen. (3) Make adjustment so that the waveform will be aligned with the vertical center graticule line on the screen when the FINE knob is pulled out (X10 MAG position). **<Check>** Repeatedly push and pull the FINE knob to make sure that the center of the waveform does not move. Deviation | less than 1 div.	 Align with center vertical graticule line. 100 90 10 0 X10 MAG	
Adjustment of MAG Center and Gain					Recheck the center at × 10 MAG and Gain.		
Adjustment of A Sweep Time 50 ms,5μs and 0.1 μs	VR2 (50 ms) VR1 (5μs) TC1 (0.1μs)	X74-1320	TG-501	H. DISPLAY: A V. MODE: CH1 A. TRIG SOURCE: V. MODE TRIG. MODE: AUTO A VAR: CAL	(1) With A. SWEEP TIME/DIV set to 50 ms, apply a marker signal of 50 ms to CH1 INPUT. (2) Adjust VR2 so that the first peak of the marker signal is aligned with the seft end of the graticule on the screen and the 11th peak with the right end. (3) Next, Rotate the A SWEEP TIME/DIV to 5 μs and apply a 5 μs time marker to CH1 INPUT and adjust VR1 in the same manner as (2) (4) Next, A SWEEP TIME/DIV to 0.1 μs and with 0.1 μs time marker to CH1 INPUT, adjust TC1 in the same manner as (2)		

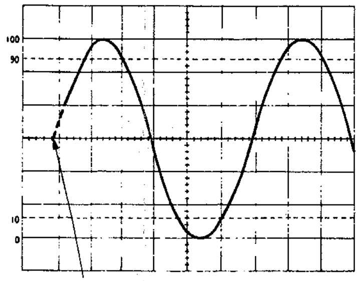
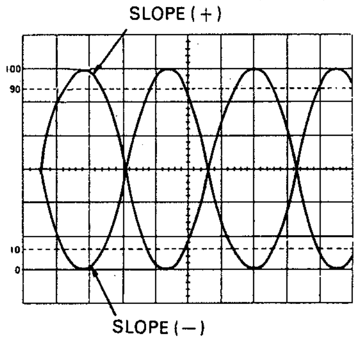
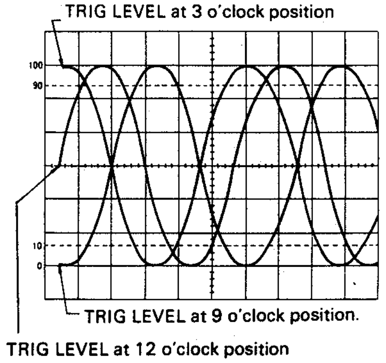
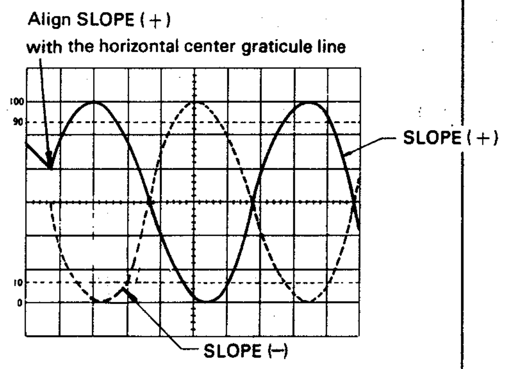
ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of B Sweep Time 50 ms, 5 μs and 0.1 μs	VR4 (50 ms) VR3 (5 μs) TC2 (0.1 μs)	X74-1320		H.DISPLAY: ALT V.MODE: CH1 A TRIG SOURCE: V. MODE B TRIG SOURCE: CH1 TRIG MODE: AUTO A, B TRIG SLOPE: + A, B INTEN: Fully CW DELAY TIME MULTI: 1.00	(1) Set A and B SWEEP TIME/DIV to 50 ms and apply a marker signal of 50 ms to CH1. (2) Operate ⇕ TRACE SEP to separate A sweep and B sweep to be in the positions where adjustment can be made easily. (3) Adjust VR4 so that the first peak of the marker signal is aligned with the left end of the graticule line on the screen and the 11th peak with the right end. (4) Rotate A and B SWEEP TIME/DIV to 5 μs and apply a 5 μs time marker to CH1 INPUT and adjust VR3 in the same manner as (3) (5) Next, A SWEEP TIME/DIV to 0.1 μs and with 0.1 μs time marker to CH1 INPUT, adjust TC2 in the same manner as (3).		
Adjustment of 0.05μs A Sweep Linearity	TC3	X74-1320		H.DISPLAY: A V.MODE: CH1 A TRIG SOURCE: V MODE A SWEEP TIME/DIV: 0.05μs A. VAR: CAL TRIG. MODE: AUTO A. TRIG SLOPE: +	(1) Apply a marker signal to CH1 INPUT. (2) Make adjustment so that the total length of the waveform is 11 div.		
Adjustment of 0.05μs B Sweep Linearity	TC4	X74-1320		H.DISPLAY: ALT V.MODE: CH1 A TRIG SOURCE: V. MODE B TRIG SOURCE: CH1 TRIG MODE: AUTO A, B TRIG SLOPE: + A,B INTEN: Fully CW DELAY TIME MULTI: 1.00	(1) With A SWEEP TIME/DIV to 0.05μs and B SWEEP TIME/DIV to 0.05μs, apply a marker signal of 0.05μs to CH1 INPUT. (2) Operate ⇕ TRACE SEP to separate A sweep and B sweep into the positions where they can be easily adjusted. (3) Make adjustment so that the total length of the waveform is 11 div.		
Check of Sweep Time Error in All the Range [I]				H.DISPLAY: A V. MODE: CH1 A TRIG SOURCE: V. MODE TRIG. MODE: AUTO A VAR: CAL	(1) Apply a reference time marker signal for each range of A SWEEP TIME/DIV. (2) Measure the time error rate and make sure it is within the specification limits. Specification | Within ±3%.		
[II]				H. DISPLAY: ALT V. MODE: CH1 A TRIG SOURCE: V. MODE B TRIG SOURCE: CH1 A. VAR: CAL TRIG. MODE: AUTO A, B TRIG SLOPE: + A, B INTEN: Fully CW DELAY TIME MULTI: 1.00	(1) Operate ⇕ TRACE SEP to separate A sweep and B sweep into the positions where they can be easily adjusted. (2) Apply a reference time marker signal in each of all the ranges (50 ms—0.05 μs) of B sweep. (3) Measure the time error rate and make sure it is within the specification limits. Specification | Within ±3%.		

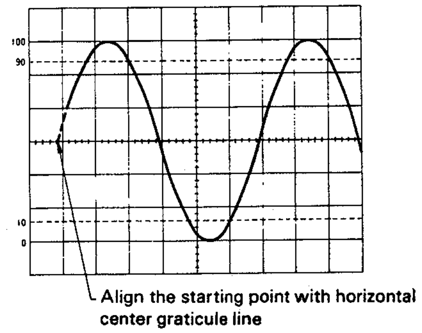
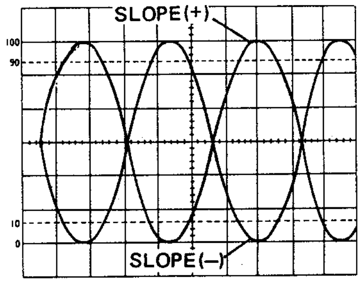
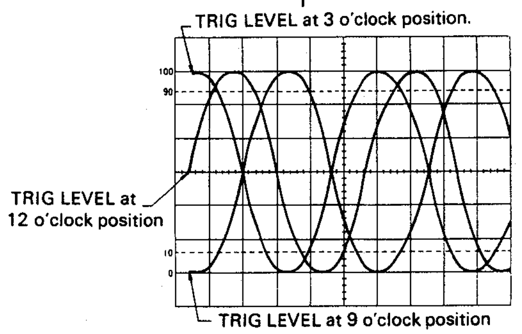
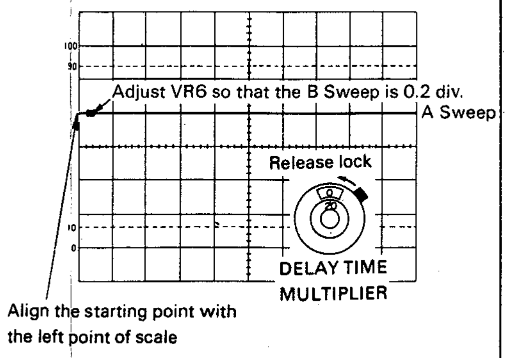
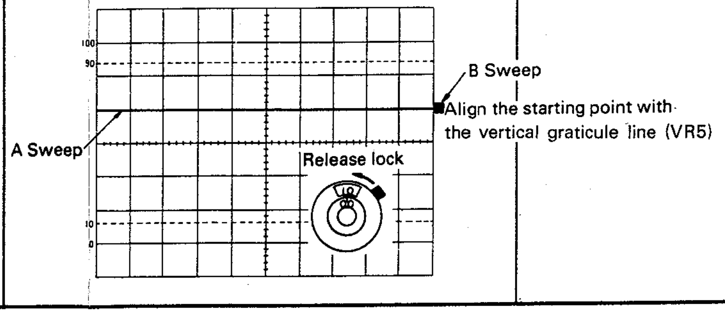
ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
ADJUSTMENT OF X − Y OPERATION							
Adjustment of X Position Center	VR15	X74-1320		H.DISPLAY: A V. MODE: DUAL, ALT CH1,CH2 VOLTS/DIV: 5mV CH1, CH2 AC-GND-DC: GND A TRIG SOURCE: CH1 TRIG. MODE: AUTO A SWEEP TIME/DIV: 0.1ms	(1) Operate⇕POSITION for both CH1 and CH2 to superimpose the two traces on one another in the center of the CRT screen. (2) Make adjustment so that the bright spot comes to the center of the screen when H. DISPLAY is switched in X-Y. **<Check>** Operate CH2 ⇕ POSITION and make sure that the spot will move as described below. (1) When the knob is turned counterclockwise, the spot moves leftward more than 5 div. (2) When the knob is turned clockwise, the spot moves rightward more than 5 div. Distance between the spot and the center of screen within ±1 div from the center of the screen.		**<Note>** When making X-Y adjustment, do not set both CH1 and CH2 to X5. GAIN.
Adjustment of X Gain	VR18	X73-1320	PG-506	H.DISPLAY: X-Y CH2 AC-GND-DC: AC CH2 VOLTS/DIV: 5mV	(1) Apply a square wave signal of 20 mVp-p 1 kHz to CH2 INPUT and make adjustment so that the horizontal amplitude is 4 div.		
Readjustment of X Position Center and X Gain					Readjust X position Center and X Gain.		
Check of X Axis Frequency Characteristic			SG-502	H. DISPLAY: X-Y CH2 AC-GND-DC: DC CH2 VOLTS/DIV: 5mV	(1) Apply a sine wave signal of 1 kHz to CH2 INPUT and adjust the oscillator output to produce a waveform of 10 div. (2) When the frequency is varied to 5 MHz without changing the oscillator output, the amplitude must be over 7.1 div (−3 dB). Frequency characteristic DC −5 MHz: less than −3 dB.		
ADJUSTMENT OF TRIGGERING							
Adjustment of A Trig Slope	VR3	X77-1110	SG-502	H.DISPLAY: A V.MODE: CH1 A TRIG SOURCE: V. MODE A COUPLING: AC CH1, CH2 AC-GND-DC: AC CH1, CH2 VOLTS/DIV: 5mV A SWEEP TIME/DIV: 0.2ms A TRIG SLOPE: + TRIG MODE: AUTO	(1) Apply a sine wave signal of 1 kHz to CH1 INPUT and adjust the oscillator output to produce a waveform of 4~6 div on the CRT screen. (2) Operate A TRIG LEVEL and CH1 ⇕ POSITION so that the waveform may have an amplitude equally above and below the horizontal center graticule line on the CRT screen. (3) Set A TRIG SLOPE to (−) and make adjustment so that the starting point of the waveform will be in the position of the starting point of the waveform when A TRIG SLOPE is in the (+) position. **<Check>** (1) Repeatedly turn the A TRIG SLOPE knob from (+) to (−) and make sure that the starting points are in the same positions. (2) Make sure that the rise slope of the waveform will be synchronized when the A TRIG SLOPE knob is in the (+) position and the fall slope will be synchronized when the knob is in the (−) position. (3) Feed the same signal to CH2 and set V MODE to CH2 to produce a waveform of CH2 and make sure that the rise slope of the waveform is synchronized when the A TRIG SLOPE knob is at (+) and the fall slope is synchronized when it is at (−) position.	 Align SLOPE (+) with the horizontal center graticule line SLOPE (+) 100 90 10 0 SLOPE (−)	

ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment A Trig Level Center	VR2	X77-1110	SG-502	H.DISPLAY: A V.MODE: CH1 A TRIG SOURCE: V. MODE A. COUPLING: AC CH1, CH2 AC-GND-DC: AC CH1, CH2 VOLTS/DIV: 5mV A SWEEP TIME/DIV: 0.2ms A TRIG SLOPE: + TRIG MODE: AUTO	(1) Set A TRIG LEVEL to 12 o'clock. (2) Apply a sine wave signal of 1 kHz to CH1 INPUT and adjust the oscillator output to produce a waveform of 4~6 div on the CRT screen. (3) Operate CH1 ⬍ POSITION to move the waveform so that its amplitude is equally above and below the horizontal center graticule line on the CRT screen. (4) Make adjustment so that the starting point of the waveform is on the horizontal center graticule line on the CRT screen. **< Check >** (1) When A TRIG SLOPE is alternately turned to (+) and (−), the starting point must be always on the horizontal center graticule line. (2) With A TRIG SLOPE remaining in the position of (+), turn TRIG LEVEL clockwise toward 3 o'clock from near 9 o'clock and see if the waveform is as shown at right. (3) Adjust the oscillator output so that the waveform amplitude becomes 0.5 div and make sure that synchronization can be obtained by A TRIG LEVEL.  100 90 10 0 Align the starting point with the horizontal center graticule line  SLOPE (+) 100 90 10 0 SLOPE (−)	 TRIG LEVEL at 3 o'clock position 100 90 10 0 TRIG LEVEL at 9 o'clock position. TRIG LEVEL at 12 o'clock position	
Adjustment of B Trig Slope	VR3	X77-1120	SG-502	H.DISPLAY: ALT V.MODE: CH1 A TRIG SOURCE: V. MODE B TRIG SOURCE: CH1 A COUPLING: AC CH1, CH2 AC-GND-DC: AC CH1, CH2 VOLTS/DIV: 5mV A, B SWEEP TIME/DIV: 0.2ms A. VAR: CAL A, B TRIG.SLOPE: + TRIG MODE: AUTO A, B INTEN: Fully CW	(1) Apply a sine wave signal of 1 kHz to CH1 INPUT and adjust the oscillator output to produce a waveform of 4~6 div on the CRT screen. (2) Operate A TRIG LEVEL, B TRIG LEVEL and CH1 ⬍ POSITION to move waveform so that its amplitude is equally above and below the horizontal center graticule line on the screen. (3) Set A INTEN to CCW and B INTEN to an arbitrary position near 3 o'clock. (4) Set B TRIG SLOPE to (−) and make adjustment so that the starting point of the waveform comes to the same position of the starting point of waveform when B TRIG SLOPE is in the (−) position. **< Check >** (1) Turn B TRIG SLOPE knob alternately to (+) and (−) and make sure that the starting point is always on the horizontal center graticule line. (2) When B TRIG SLOPE is in the (+) position, the rise slope of the waveform should be synchronized and its fall slope be synchronized at (−). (3) Apply the same signal to CH2 and set V. MODE to CH2 to produce a waveform of B sweep of CH2 on the screen to make sure that the rise slope of the waveform is synchronized when B TRIG SLOPE is at (+) and the fall slope is synchronized at (−).	 Align SLOPE (+) with the horizontal center graticule line 100 90 10 0 SLOPE (+) SLOPE (−)	

ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of B Trig Level Center	VR2	X77-1120	SG-502	H.DISPLAY: ALT V. MODE: CH1 A COUPLING: AC CH1, CH2 AC-GND-DC: AC CH1, CH2 VOLTS/DIV: 5mV A, B SWEEP TIME/DIV: 0.2ms A. VAR: CAL B. TRIG SOURCE: CH1	(1) Turn B TRIG LEVEL knob to 12 o'clock. (2) Apply a sine wave signal of 1 kHz to CH1 INPUT and adjust the oscillator output to produce a waveform of 4∼6 div on the CRT screen. (3) Operate CH1 ⇕ POSITION so that the waveform has an amplitude equally above and below the horizontal center graticule line on the screen. (4) Turn A INTEN to CCW and B INTEN to a position near 3 o'clock and make adjustment so that the starting point of the waveform is on the horizontal center graticule line. < Check > (1) Turn B TRIG SLOPE alternately to (+) and (−) and make sure that the starting point of the waveform is always on the horizontal center graticule line. (2) With B TRIG SLOPE knob remaining in the (+) position, turn TRIG LEVEL knob clockwise toward 3 o'clock from near 9 o'clock and see if the waveform appear as shown at right. (3) Adjust the oscillator output so that the waveform amplitude becomes 0.5 div and make sure that synchronization is obtained at this time by operating B TRIG LEVEL.  100 90 10 0 Align the starting point with horizontal center graticule line  SLOPE(+) SLOPE(−) 100 90 10 0	 TRIG LEVEL at 3 o'clock position. TRIG LEVEL at 12 o'clock position TRIG LEVEL at 9 o'clock position 100 90 10 0	
Adjustment of DELAY TIME MULTIPLIER	VR6 VR5	X74-1320 X74-1320		H. DISPLAY: ALT V. MODE: CH1 CH1 AC-GND-DC: GND TRIG MODE: AUTO A SWEEP TIME/DIV: 0.1ms B SWEEP TIME/DIV: 1 μs ⇕ TRACE SEP: NORM B SOURCE : START AFTER DELAY	(1) Set DELAY TIME MULTIPLIER to 0.20. (2) Operate A INTEN and B INTEN properly to make B trace brighter and A trace light dimmer. (3) Operate ◂▸POSITION to bring the starting point of A trace to the left end of the graticule line on the CRT screen. (4) Make adjustment so that B trace may appear as shown at right. (5) Next, set DELAY TIME MULTIPLIER to 10:00. Make adjustment so that B trace may appear as shown at right. (6) Repeat (1) thru (5) 2 or 3 times. < Check > Set DELAY TIME MULTIPLIER to 5.00 and make sure that the starting point of B trace is in a position within 5 div ±0.2 div from the left end of the screen.	 100 90 Adjust VR6 so that the B Sweep is 0.2 div. A Sweep Release lock 0 20 10 0 DELAY TIME MULTIPLIER Align the starting point with the left point of scale  100 90 B Sweep Align the starting point with the vertical graticule line (VR5) A Sweep Release lock 10 00 10 0	

ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
OPERATING CHECKS							
Check of Triggering Sensitivity			SG-502 SG-503 475A	V.MODE: CH1 CH1 VOLTS/DIV: 5mV A,B SWEEP TIME/DIV: arbitrary position CH1 AC-GND-DC: AC TRIG MODE: NORM	(1) Make measurements of triggering sensitivity according to the table given below. (For both A and B sweeps) [I] **A Sweep, INT** (1) Set H DISPLAY to A and A TRIG SOURCE to CH1. (2) Apply a sine wave signal to CH1 INPUT, vary the oscillator output and operate A TRIG LEVEL to measure the minimum synchronizing amplitude on the CRT screen. When doing this, make sure that the A TRIG' D lamp is on. Check synchronization by each check frequency. [II] **B Sweep, INT** (1) Set H DISPLAY to B DLY'D, A TRIG SOURCE to CH1 and B TRIG SOURCE to CH1. (2) Apply a sine wave to CH1 INPUT, vary the oscillator output and operate B TRIG LEVEL to measure the minimum synchronizing amplitude. When doing this, make sure that the A TRIG'D and B TRIG'D lamps are on. Check synchronization by each frequency. [III] **A Sweep, EXT** (1) Set H DISPLAY to A and A TRIG SOURCE to EXT CH3. (2) Apply a signal of the same voltage simultaneously to CH1 and CH4 INPUT. (3) Operate CH1 VOLTS/DIV to produce a waveform of 6 div on the CRT screen. (4) Vary the oscillator output and operate A TRIG LEVEL to measure the minimum synchronizing amplitude by the oscilloscope (475A). Check synchronization by each check frequency. When doing this, make sure that A TRIG'D lamp is on. [IV] **B Sweep, EXT** (1) Set H DISPLAY to ALT, A TRIG SOURCE to CH1 and B TRIG SOURCE to EXT CH4. (2) Apply a signal of the same voltage simultaneously to CH1 and CH4 INPUT. (3) Operate CH1 VOLTS/DIV to produce a waveform of 6 div on the CRT screen. (4) Operate B TRIG LEVEL and A TRIG LEVEL to synchronize both A sweep and B sweep. (5) Vary the oscillator output and operate B TRIG LEVEL and measure the minimum synchronizing amplitude by the oscilloscope (475A). Check synchronization by each check frequency. (6) Make sure that the B TRIG'D lamp is on.		

ADJUSTMENT

Item	Adjustment Control	P.C.B No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark

[V] Check of triggering sensitivity

COUPLING (TRIG. SOURCE)	FREQ RANGE (Hz)	Trig. sensitivity (Min. sync amplitude)	
		TRIG. SOURCE V.MODE (CH1 or CH2)	TRIG SOURCE EXT CH3 or CH4
AC	20Hz ~ 20MHz ~ 70MHz	0.5div 1.5div	50mVP-p 150mVp-p
DC	DC ~ 20MHz ~ 70MHz	0.5div 1.5div	50mVp-p 150mVp-p
AC $\mathrm{HF_{REJ}}$	1kHz 1MHz	0.5div Not to be synchronized at 1 div	50mVp-p Not to be synchronized at 100mVp-p
AC $\mathrm{LF_{REJ}}$	1MHz 1kHz	0.5div Not to be synchronized at 1 div	50mVp-p Not to be synchronized at 100mVp-p
VIDEO	VIDEO signal FRAME LINE	0.5div	50mVp-p

[VI] Check of triggering sensitivity by TRIG. MODE

H. DISPLAY : A, A SOURCE : AC

COUPLING (TRIG. SOURCE)	FREQ RANGE (Hz)	Trig. sensitivity (Min. sync. amplitude)	
		TRIG SOURCE V.MODE (CH1 or CH2)	TRIG. SOURCE EXT
AUTO	30Hz ~ 20MHz ~ 70MHz	0.5div 1.5div	50mVp-p 150mVp-p

[VII] Check of trig source (A sweep)

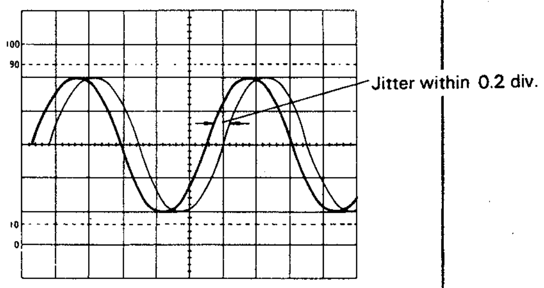
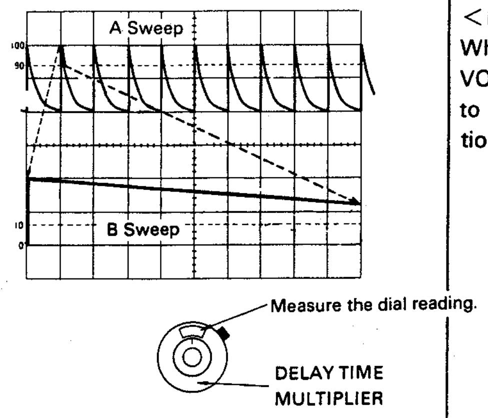
① TRIG MODE: AUTO, H.DISPLAY: A

② Applied different signals to CH1 ~ CH4 and operate A SOURCE as described below and make sure to operate as follow.

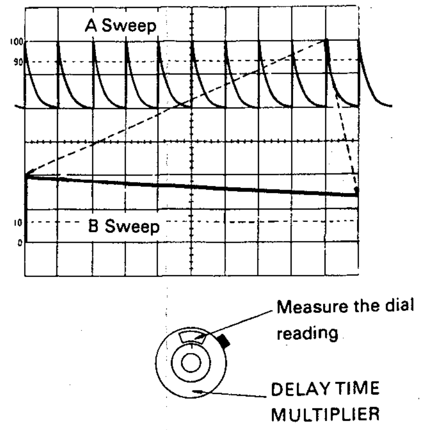
A SOURCE	Operation
V.MODE	V.MODE→ CH1 The signal of CH1 is synchronized with A sweep V.MODE→ CH2 The signal of CH2 is synchronized with A sweep V.MODE→ DUAL. ALT When the signals of CH1 and CH2 are superimposed on one another they are synchronized with the A sweep of CH1 and CH2, respectively, but there will be no synchronization when there is no signal V. MODE→DUAL, CHOP No Sync. V. MODE→ADD Synchronized with the signal of CH2 when CH1 + CH2 (CH1 − CH2 at CH2 INV) V.MODE→ QUAD, ALT When the signals of CH1 ~ CH4 are superimposed on one another on the CRT screen, the signals will be synchronized with the A sweep of CH1 ~ CH4 respectively but there will be no sync when there is no signal. V.MODE→QUAD, CHOP No Sync.
CH1	The signal of CH1 is synchronized with A sweep
CH2	The signal of CH2 is synchronized with A sweep
EXT CH3	*The signal of CH3 is synchronized with A sweep*

③ Check sync by the lighting of A TRIG'D lamp

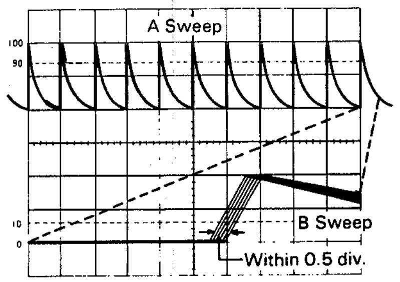
ADJUSTMENT

<table>
<tr><th>Item</th><th>Adjustment Control</th><th>P.C.B No.</th><th>Test Equipment</th><th>Control Setting</th><th>Adjustment and Check</th><th>Illustration</th><th>Remark</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>[VIII] Check of trig source (B sweep)
(1) Set H DISPLAY to A, TRIG MODE to AUTO, V MODE to DUAL, ALT and A TRIG SOURCE to V MODE.
(2) Apply different signals to CH1, CH2 and CH4 and superimpose the signals of CH1 and CH2 on one another on the CRT screen and synchronize them by A TRIG LEVEL.
(3) Set H DISPLAY to B DLY'D and operate B SOURCE as described below to check the synchronization.
<table>
<tr><th>B TRIG SOURCE</th><th>Operation</th></tr>
<tr><td>CH1</td><td>The signal of CH1 is synchronized with B sweep.</td></tr>
<tr><td>CH2</td><td>The signal of CH2 is synchronized with B sweep.</td></tr>
<tr><td>EXT CH4</td><td>The signal of CH4 is synchronized with B sweep.</td></tr>
</table>
(4) Make sure that the B TRIG'D lamp is on.</td><td></td><td></td></tr>
<tr><td>Check of Jitter</td><td></td><td></td><td>SG503</td><td>H.DISPLAY: A
A.TRIG SOURCE: CH1
TRIG MODE: NORM
A COUPLING: AC
A SWEEP TIME/DIV: 0.05μs
CH1 VOLTS/DIV: 0.1V
CH1 AC-GND-DC: AC
X10 MAG: PULL
HOLDOFF: NORM</td><td>(1) Apply a sine wave signal of 70 MHz to CH1 INPUT and adjust the oscillator output to produce a waveform of 4 div on the CRT screen.
(2) Operate A TRIG LEVEL to find a point where the jitter is minimized.
<table>
<tr><td>Jitter</td><td>Less than 0.2 div</td></tr>
</table></td><td>
</td><td></td></tr>
<tr><td>Operational Check of DELAY TIME MULTIPLIER</td><td></td><td></td><td>TG-501</td><td>H.DISPLAY: ALT
A, B TRIG SOURCE: CH1
TRIG MODE: AUTO
V. MODE: CH1
B SOURCE: STARTS AFTER DELAY
CH1 AC-GND-DC: AC
A SWEEP TIME/DIV: 1ms
B SWEEP TIME/DIV: 5μs</td><td>(1) Apply a marker signal of 1 ms to CH1 INPUT produce a waveform of 2~3 div on the CRT screen.
(2) Operate ⇕ TRACE SEP to separate B sweep and A sweep.
(3) Operate ◂▸ POSITION to align the first peak of the waveform with the left end of the screen.
(4) Adjust A INTEN and B INTEN to bring the waveform into the positions where they can be easily visible.
(5) Operate DELAY TIME MULTIPLIER so that the patterns of the screen appear as shown at right (the second peak of the A sweep should be intensity modulated and should be aligned with the left end of B sweep scale) and note the dial reading at this time.</td><td>
</td><td><Note>
When TG-501 is used, CH1 VOLTS/DIV should be set to 0.5V thru 50Ω termination.</td></tr>
</table>

ADJUSTMENT

<table>
<tr><th>Item</th><th>Adjustment Control</th><th>P.C.B No.</th><th>Test Equipment</th><th>Control Setting</th><th>Adjustment and Check</th><th>Illustration</th><th>Remark</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>(6) Turn DELAY TIME MULTIPLIER and operate ◂▸ POSITION so that what is shown at right will happen at the 10th peak and note the dial reading at this time.
(7) Make the following calculation from the dial reading to make sure that the error is within the specification limits.
(B) − (A) = 8.00 ±0.2
<table><tr><td>Time multiplication error</td><td>within ±2%</td></tr></table></td><td>

A Sweep
100
90
10
0
B Sweep
Measure the dial reading
DELAY TIME MULTIPLIER

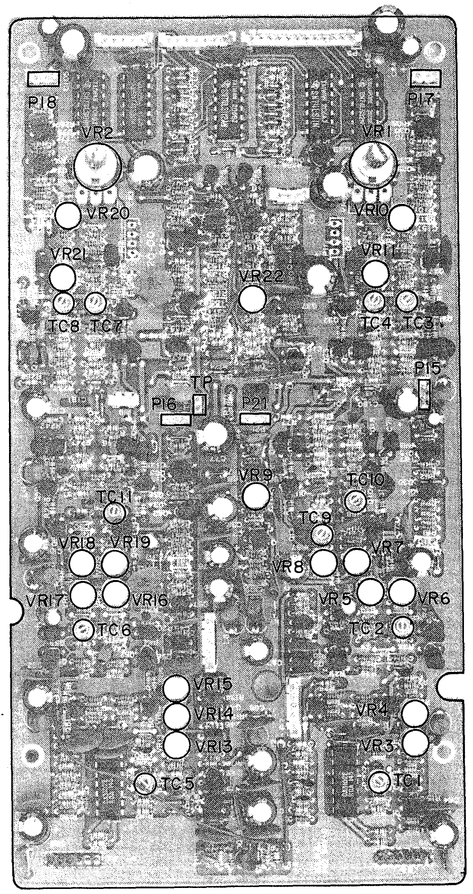
</td><td></td></tr>
<tr><td>Check of
DELAY TIME Jitter</td><td></td><td></td><td>TG-501</td><td>H.DISPLAY: ALT
A TRIG SOURCE: CH1
B TRIG SOURCE: CH2
TRIG MODE: AUTO
V. MODE: CH1
B SOURCE: STARTS AFTER DELAY
B ENDS A: ON
CH1 AC-GND-DC: AC
A SWEEP TIME/DIV: 1ms
B SWEEP TIME/DIV: 1μs</td><td>(1) Apply a marker signal of 1 ms to CH1 INPUT to produce a waveform of 2∼3 div on the CRT screen
(2) Operate ⬍ TRACE SEP to separate A sweep and B sweep.
(3) Operate DELAY TIME MULTIPLIER to obtain the patterns as shown at right. (DELAY TIME MULTIPLIER is to be set to about 1.00).
(4) Make sure that the jitter of B sweep is less than 0.5 div at this time.
<table><tr><td>Specification</td><td>Less than 1/20,000</td></tr></table></td><td>

A Sweep
100
90
10
0
B Sweep
Within 0.5 div.

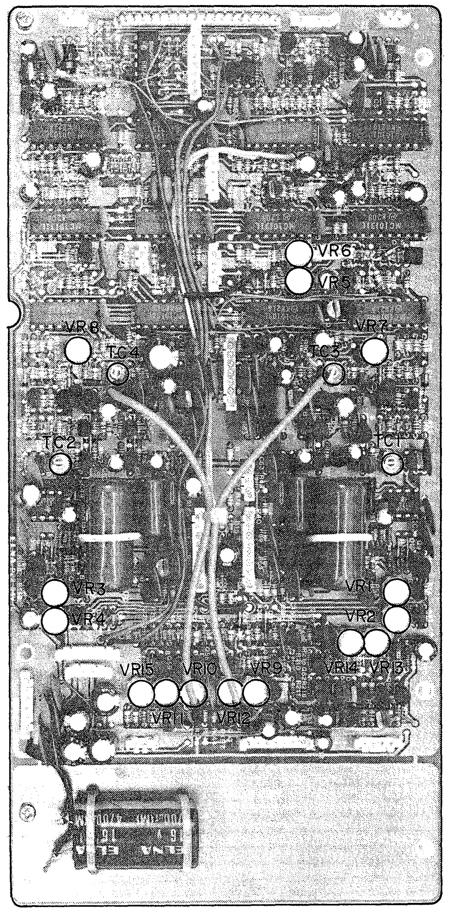
</td><td></td></tr>
</table>

ADJUSTMENT

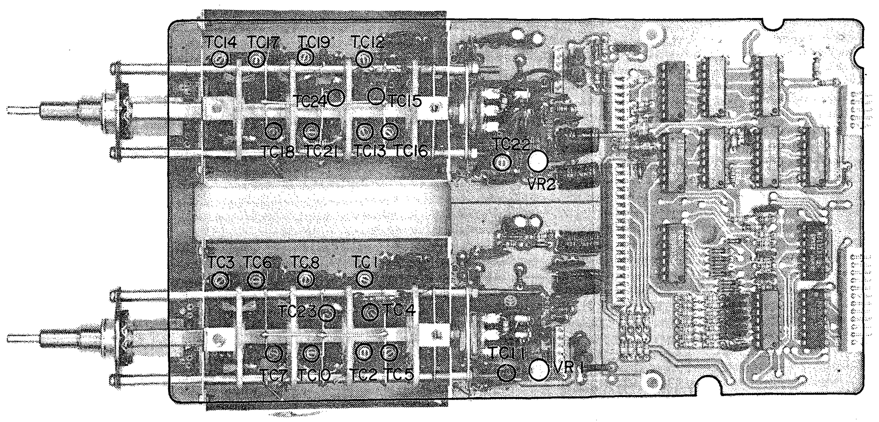
X73-1320-01


P18
P17
VR2
VR1
VR20
VR10
VR21
VR22
VR11
TC8
TC7
TC4
TC3
P15
TP
P16
P21
VR9
TC10
TC11
TC9
VR18
VR19
VR8
VR7
VR17
VR16
VR5
VR6
TC6
TC2
VR15
VR14
VR4
VR13
VR3
TC5
TC1

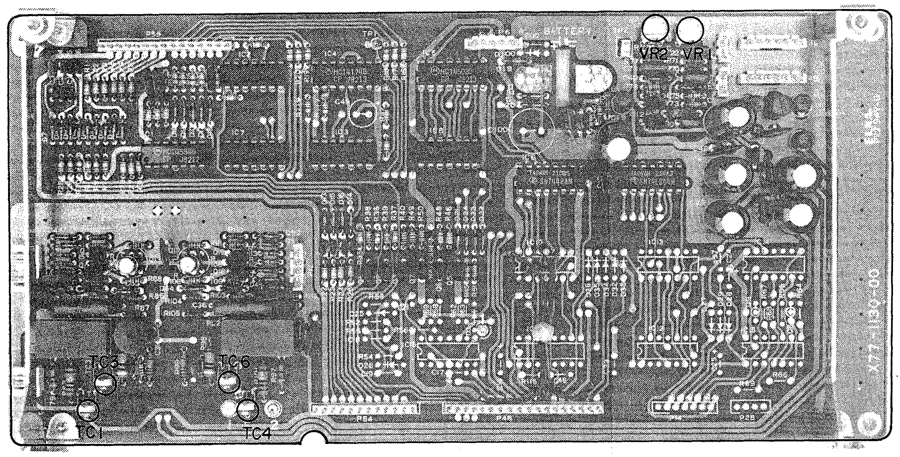
X74-1320-01


VR6
VR5
VR8
VR7
TC4
TC3
TC2
TC1
VR3
VR4
VR1
VR2
VR15
VR16
VR9
VR14
VR13
VR11
VR12

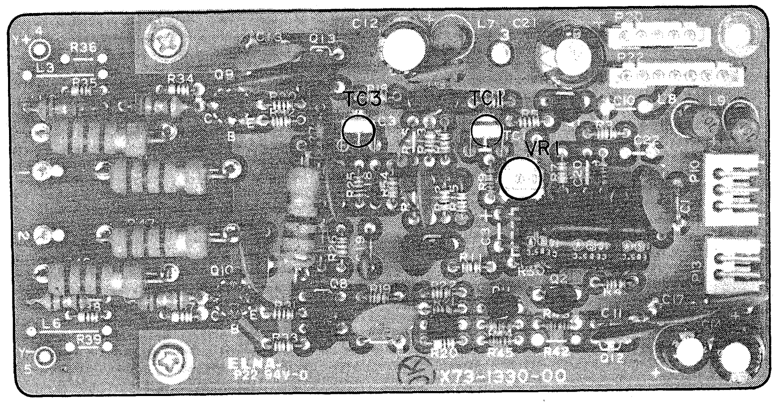
X75-1120-01


TC14
TC17
TC19
TC12
TC24
TC15
TC18
TC21
TC13
TC16
TC22
VR2
TC3
TC6
TC8
TC1
TC23
TC4
TC11
VR1
TC7
TC10
TC2
TC5

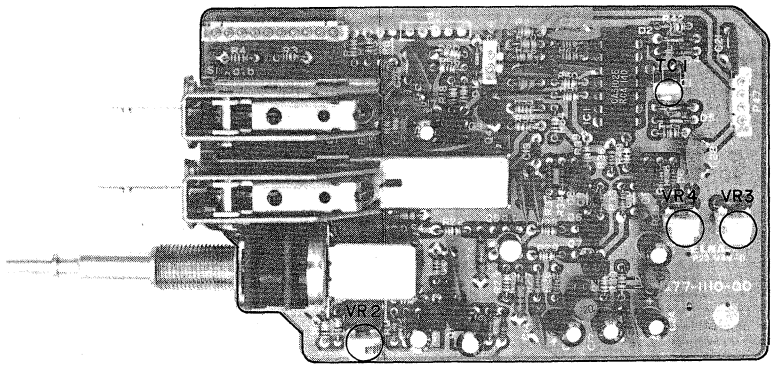
X77-1130-01


VR2
VR1
TC3
TC6
TC1
TC4

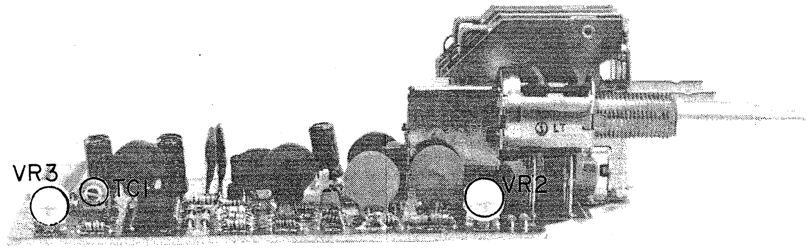
X73-1330-01


TC3
TC1
VR1
X73-1330-00

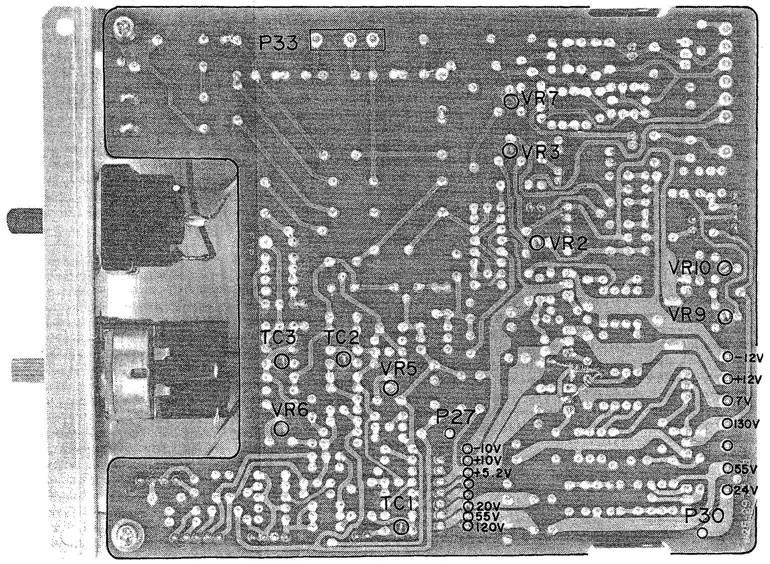
X77-1110-01


TC1
VR4
VR3
VR2
X77-1110-00

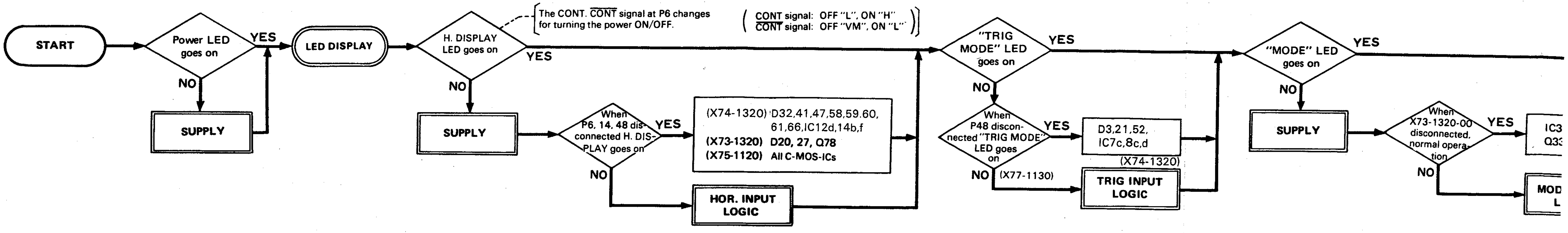
X77-1120-01

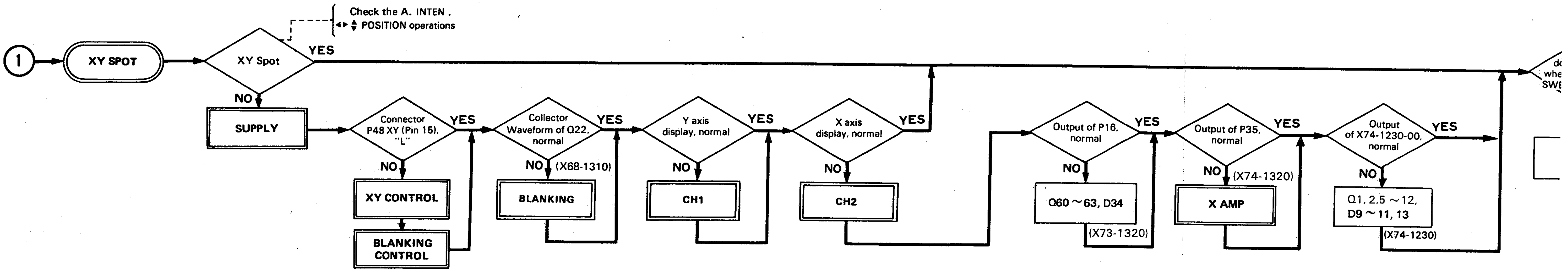


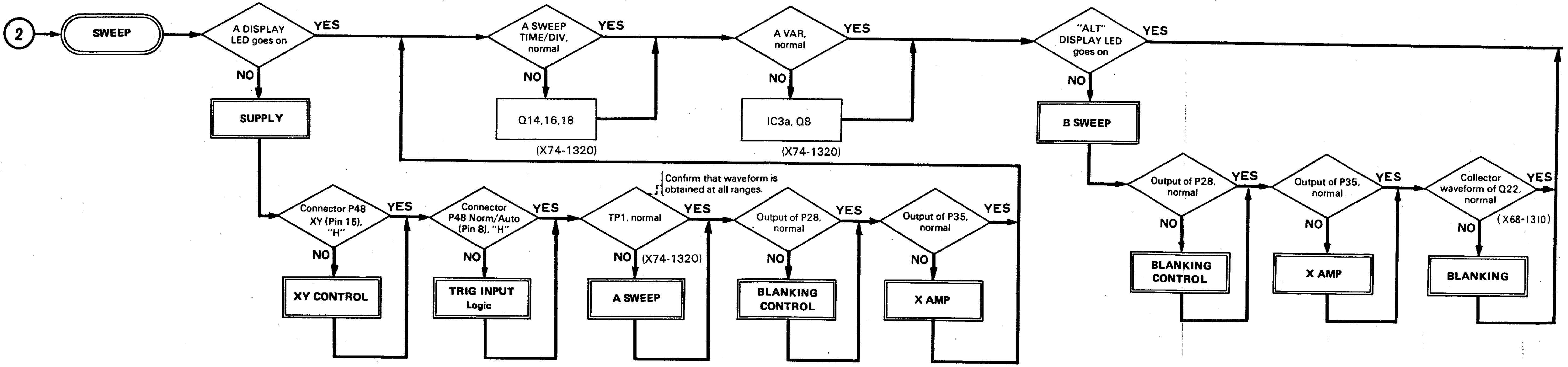
X68-1310-01


P33
VR7
VR3
VR2
VR10
VR9
TC3
TC2
VR5
VR6
P27
TC1
P30
-12V
+12V
7V
130V
55V
24V
-10V
+10V
+5.2V
20V
55V
120V

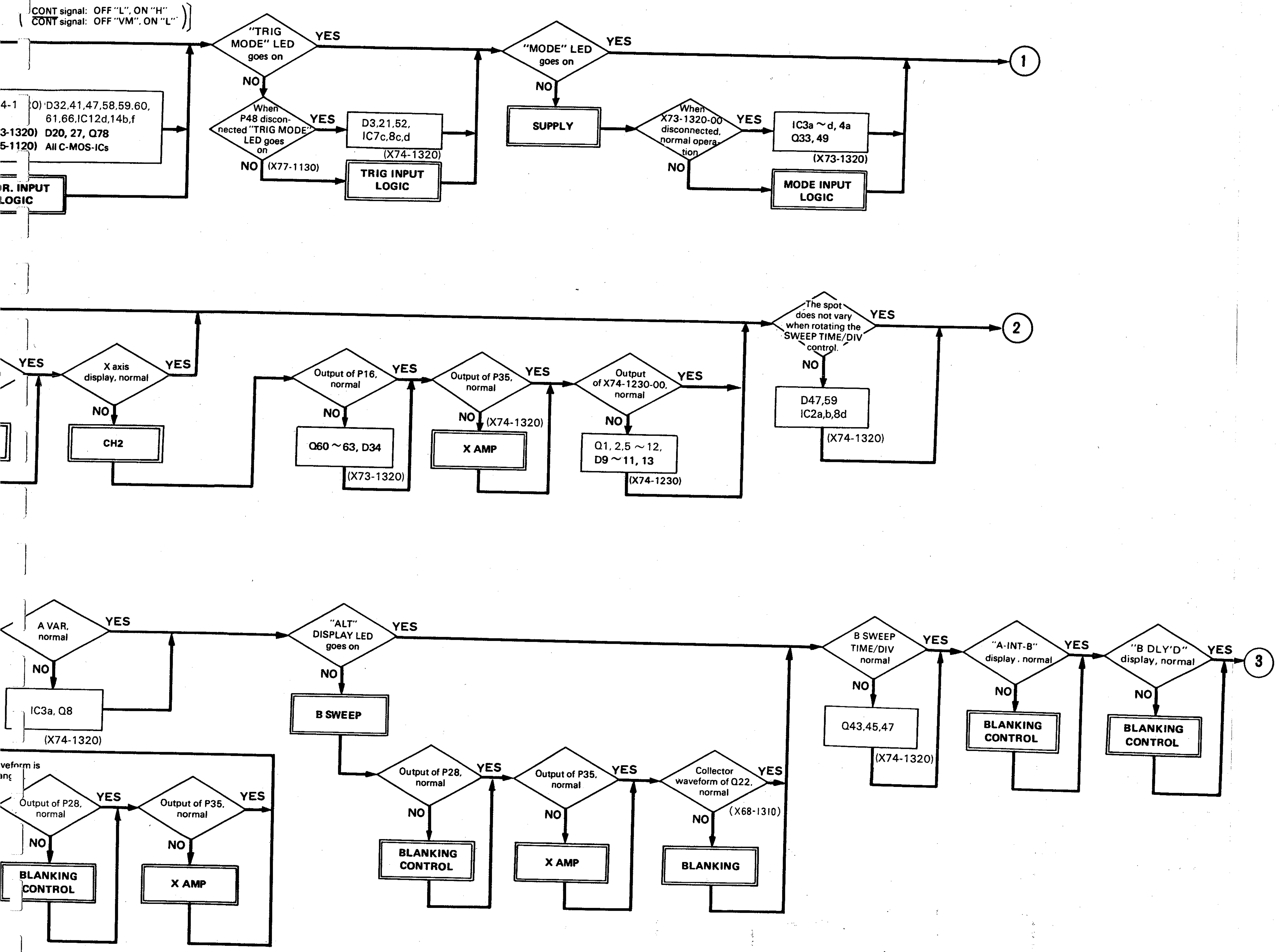
TROUBLESHOOTING

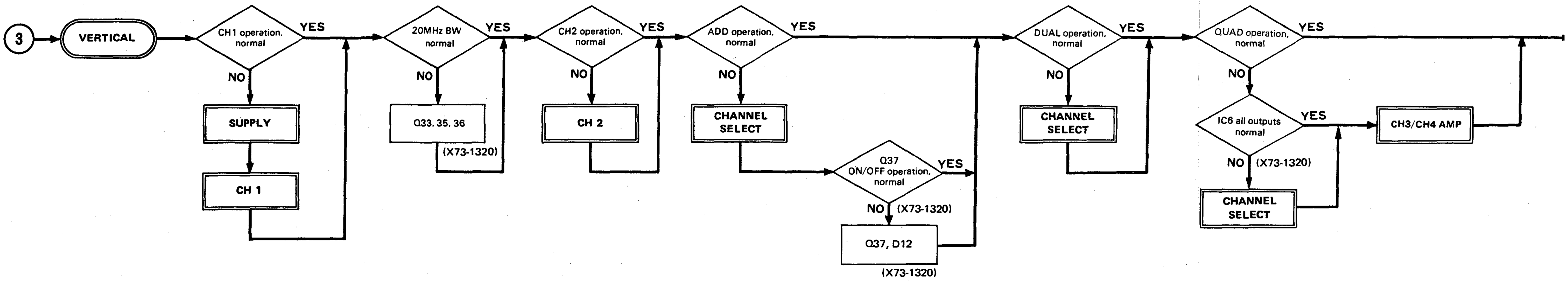

START
Power LED goes on
YES
NO
SUPPLY
LED DISPLAY
H. DISPLAY LED goes on
YES
NO
The CONT. $\overline{\text{CONT}}$ signal at P6 changes for turning the power ON/OFF.
CONT signal: OFF "L", ON "H"
$\overline{\text{CONT}}$ signal: OFF "VM", ON "L"
SUPPLY
When P6, 14, 48 disconnected H. DISPLAY goes on
YES
NO
(X74-1320) D32,41,47,58,59.60, 61,66,IC12d,14b,f
(X73-1320) D20, 27, Q78
(X75-1120) All C-MOS-ICs
HOR. INPUT LOGIC
"TRIG MODE" LED goes on
YES
NO
When P48 disconnected "TRIG MODE" LED goes on
YES
NO
D3,21,52, IC7c,8c,d
(X74-1320)
(X77-1130)
TRIG INPUT LOGIC
"MODE" LED goes on
YES
NO
SUPPLY
When X73-1320-00 disconnected, normal operation
YES
NO
IC3
Q3
MOD
L

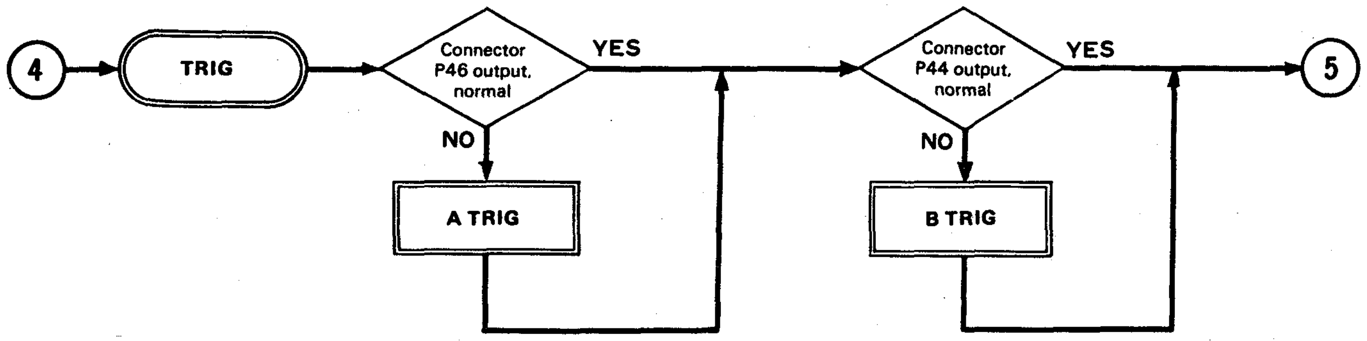

1
XY SPOT
XY Spot
YES
NO
Check the A. INTEN. ◂▸ ▴▾ POSITION operations
SUPPLY
Connector P48 XY (Pin 15), "L"
YES
NO
XY CONTROL
BLANKING CONTROL
Collector Waveform of Q22, normal
YES
NO
(X68-1310)
BLANKING
Y axis display, normal
YES
NO
CH1
X axis display, normal
YES
NO
CH2
Output of P16, normal
YES
NO
Q60 ~ 63, D34
(X73-1320)
Output of P35, normal
YES
NO
(X74-1320)
X AMP
Output of X74-1230-00, normal
YES
NO
Q1, 2,5 ~ 12, D9 ~ 11, 13
(X74-1230)
dc
whe
SWE

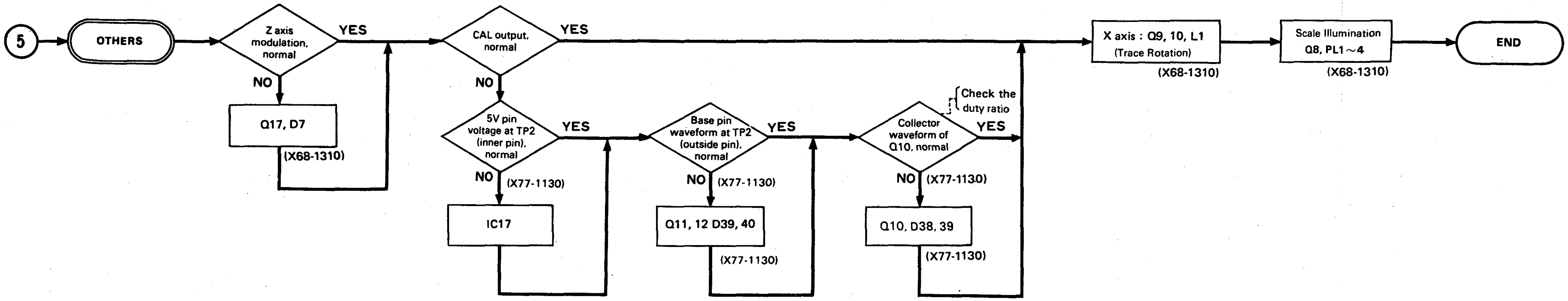

2
SWEEP
A DISPLAY LED goes on
YES
NO
SUPPLY
A SWEEP TIME/DIV, normal
YES
NO
Q14,16,18
(X74-1320)
A VAR, normal
YES
NO
IC3a, Q8
(X74-1320)
"ALT" DISPLAY LED goes on
YES
NO
B SWEEP
Output of P28, normal
YES
NO
BLANKING CONTROL
Output of P35, normal
YES
NO
X AMP
Collector waveform of Q22, normal
YES
NO
(X68-1310)
BLANKING
Connector P48 XY (Pin 15), "H"
YES
NO
XY CONTROL
Connector P48 Norm/Auto (Pin 8), "H"
YES
NO
TRIG INPUT Logic
Confirm that waveform is obtained at all ranges.
TP1, normal
YES
NO
(X74-1320)
A SWEEP
Output of P28, normal
YES
NO
BLANKING CONTROL
Output of P35, normal
YES
NO
X AMP

TROUBLESHOOTING


CONT signal: OFF "L", ON "H"
CONT signal: OFF "VM", ON "L"
"TRIG MODE" LED goes on
YES
NO
When P48 discon-nected "TRIG MODE" LED goes on
YES
NO
(X77-1130)
4-1 0) D32,41,47,58,59.60, 61,66,IC12d,14b,f
3-1320) D20, 27, Q78
5-1120) All C-MOS-ICs
R. INPUT LOGIC
D3,21,52, IC7c,8c,d
(X74-1320)
TRIG INPUT LOGIC
"MODE" LED goes on
YES
NO
SUPPLY
When X73-1320-00 disconnected, normal opera-tion
YES
NO
IC3a ~ d, 4a Q33, 49
(X73-1320)
MODE INPUT LOGIC
1
YES
X axis display, normal
YES
NO
CH2
Output of P16, normal
YES
NO
Q60 ~ 63, D34
(X73-1320)
Output of P35, normal
YES
NO
(X74-1320)
X AMP
Output of X74-1230-00, normal
YES
NO
Q1, 2,5 ~ 12, D9 ~ 11, 13
(X74-1230)
The spot does not vary when rotating the SWEEP TIME/DIV control.
YES
NO
D47,59 IC2a,b,8d
(X74-1320)
2
A VAR. normal
YES
NO
IC3a, Q8
(X74-1320)
"ALT" DISPLAY LED goes on
YES
NO
B SWEEP
Output of P28, normal
YES
NO
BLANKING CONTROL
Output of P35, normal
YES
NO
X AMP
Collector waveform of Q22, normal
YES
NO
(X68-1310)
BLANKING
B SWEEP TIME/DIV normal
YES
NO
Q43,45,47
(X74-1320)
"A-INT-B" display, normal
YES
NO
BLANKING CONTROL
"B DLY'D" display, normal
YES
NO
BLANKING CONTROL
3
veform is
Output of P28, normal
YES
NO
BLANKING CONTROL
Output of P35, normal
YES
NO
X AMP


3
VERTICAL
CH1 operation, normal
YES
NO
SUPPLY
CH 1
20MHz BW normal
YES
NO
Q33, 35, 36
(X73-1320)
CH2 operation, normal
YES
NO
CH 2
ADD operation, normal
YES
NO
CHANNEL SELECT
Q37 ON/OFF operation, normal
YES
NO
(X73-1320)
Q37, D12
(X73-1320)
DUAL operation, normal
YES
NO
CHANNEL SELECT
QUAD operation, normal
YES
NO
IC6 all outputs normal
YES
NO
(X73-1320)
CH3/CH4 AMP
CHANNEL SELECT

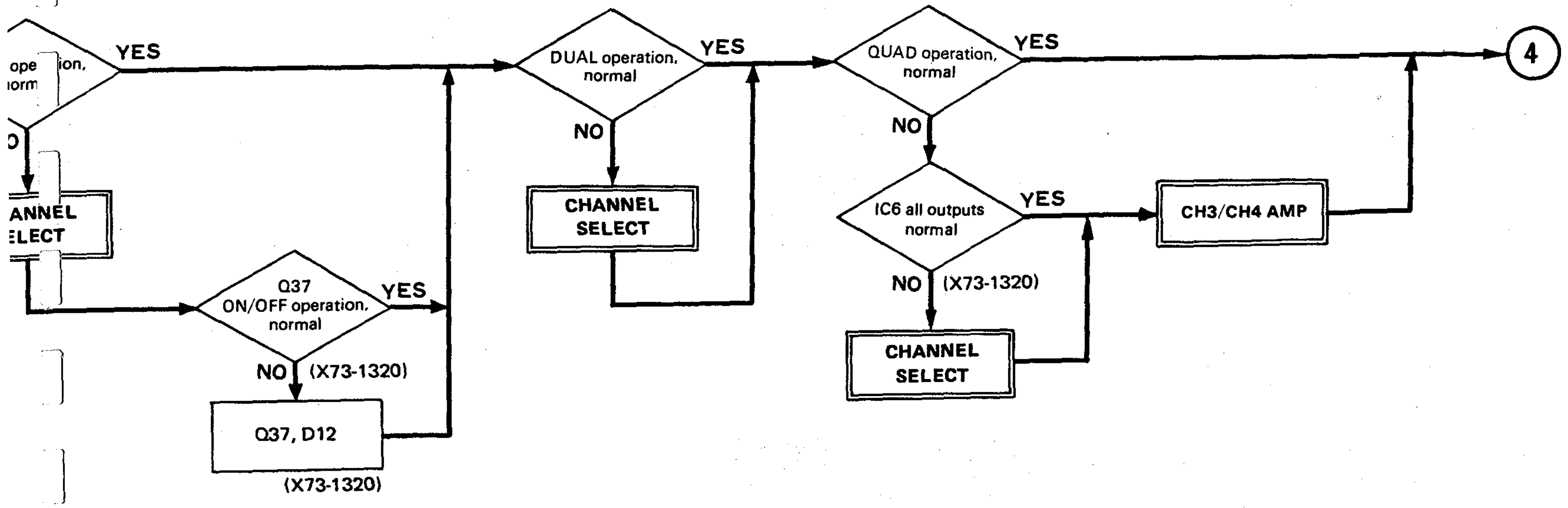

4
TRIG
Connector P46 output, normal
YES
NO
A TRIG
Connector P44 output, normal
YES
NO
B TRIG
5

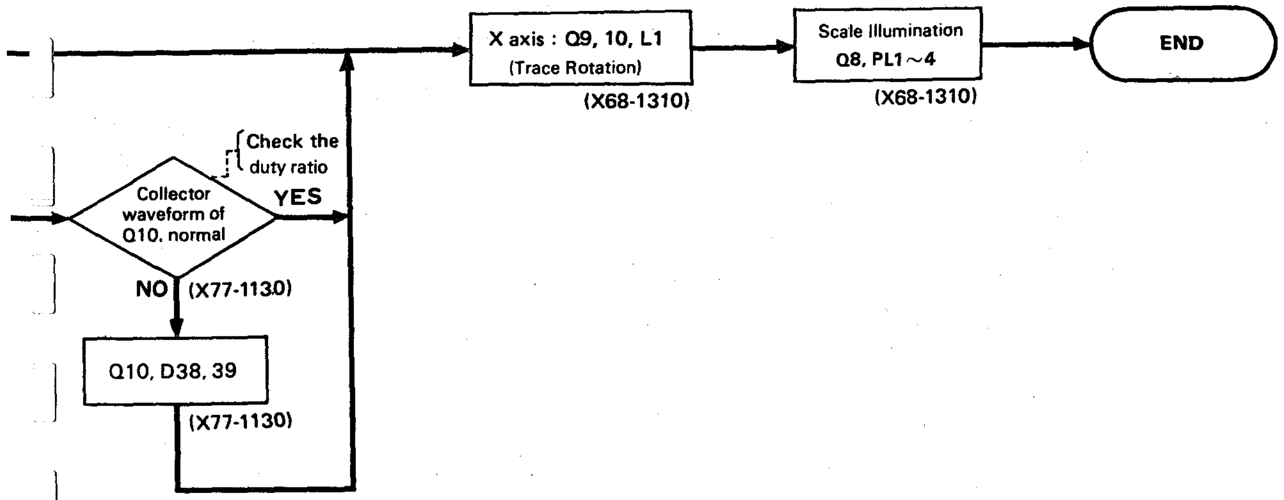

5
OTHERS
Z axis modulation, normal
YES
NO
Q17, D7
(X68-1310)
CAL output, normal
YES
NO
5V pin voltage at TP2 (inner pin), normal
YES
NO
(X77-1130)
IC17
Base pin waveform at TP2 (outside pin), normal
YES
NO
(X77-1130)
Q11, 12 D39, 40
(X77-1130)
Collector waveform of Q10, normal
Check the duty ratio
YES
NO
(X77-1130)
Q10, D38, 39
(X77-1130)
X axis : Q9, 10, L1
(Trace Rotation)
(X68-1310)
Scale Illumination
Q8, PL1～4
(X68-1310)
END

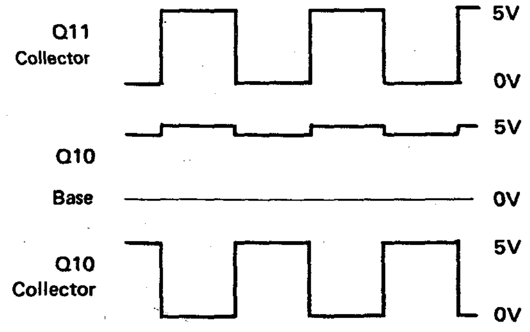
Colle

Colle

TROUBLESHOOTING


ope ion,
iorm
YES
O
ANNEL
ELECT
Q37
ON/OFF operation,
normal
YES
NO
(X73-1320)
Q37, D12
(X73-1320)
DUAL operation,
normal
YES
NO
CHANNEL
SELECT
QUAD operation,
normal
YES
NO
IC6 all outputs
normal
YES
NO
(X73-1320)
CHANNEL
SELECT
CH3/CH4 AMP
4

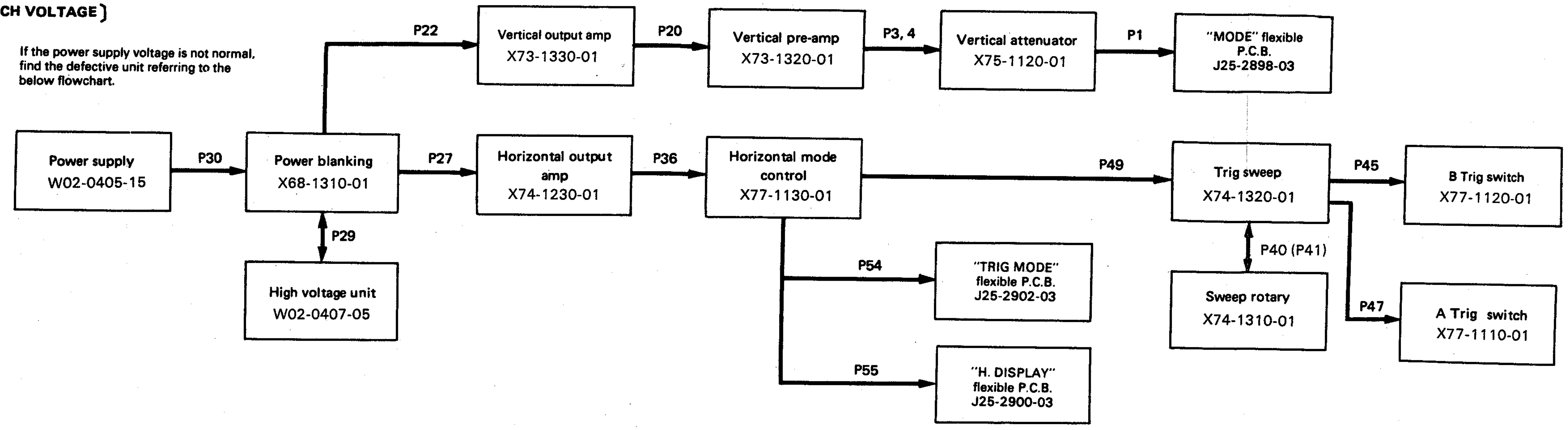

X axis : Q9, 10, L1
(Trace Rotation)
(X68-1310)
Scale Illumination
Q8, PL1~4
(X68-1310)
END
Check the
duty ratio
Collector
waveform of
Q10, normal
YES
NO
(X77-1130)
Q10, D38, 39
(X77-1130)

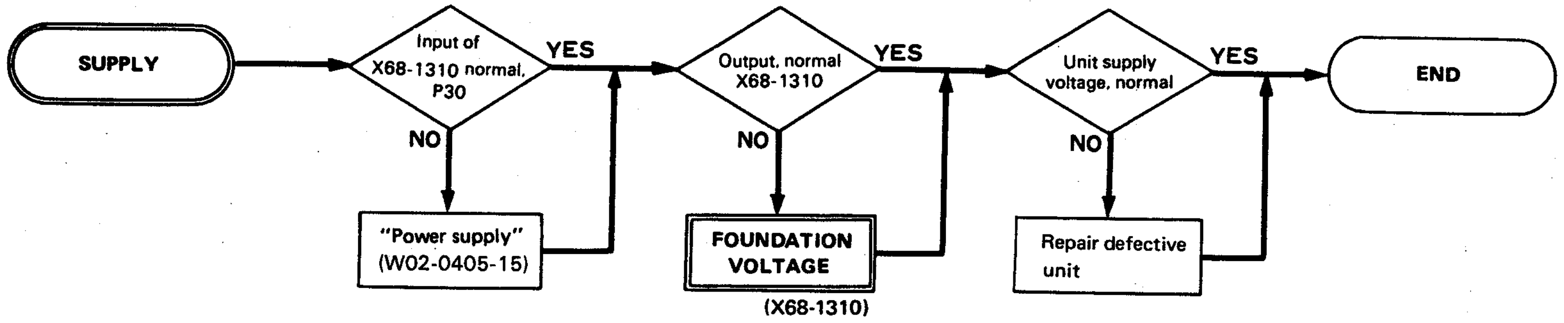

Q11
Collector
5V
0V
5V
Q10
Base
0V
5V
Q10
Collector
0V

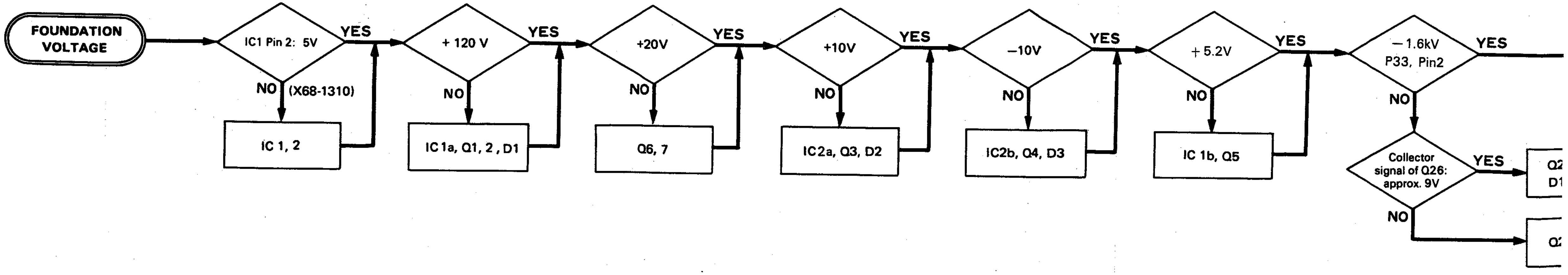
CAL CIRCUIT WAVEFORMS

(POWER SUPPLY OF EACH VOLTAGE)

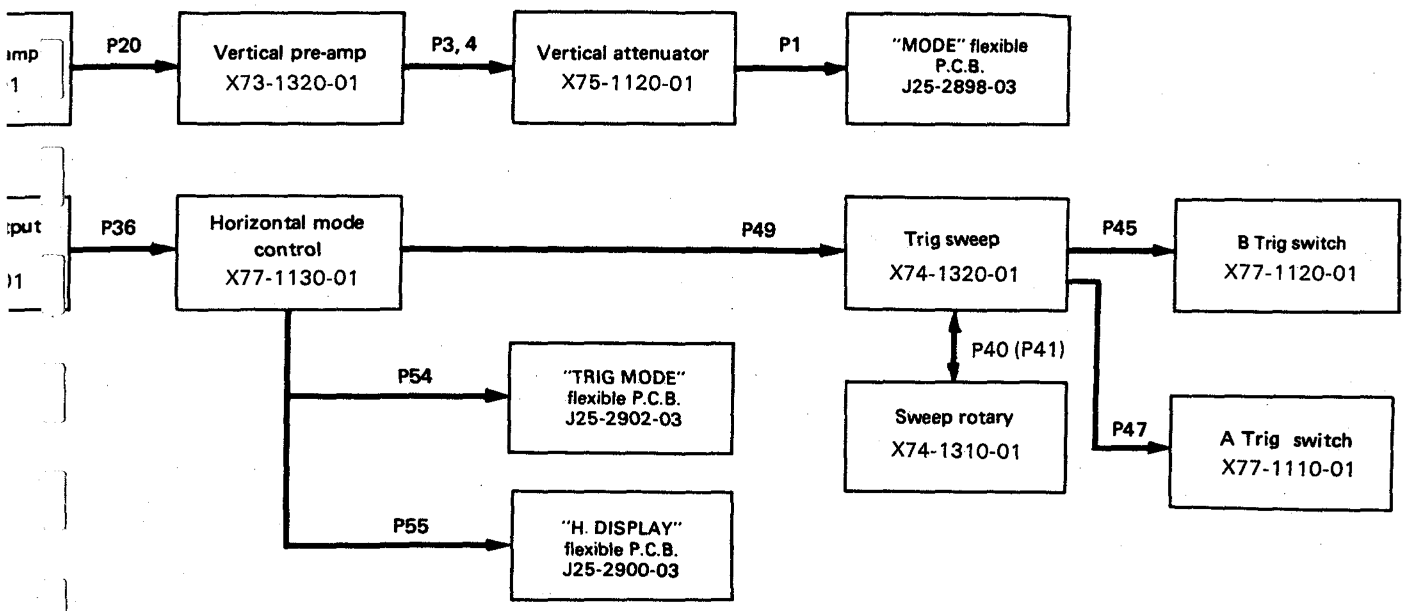
If the power supply voltage is not normal, find the defective unit referring to the below flowchart.


Power supply
W02-0405-15
P30
Power blanking
X68-1310-01
P29
High voltage unit
W02-0407-05
P22
Vertical output amp
X73-1330-01
P20
Vertical pre-amp
X73-1320-01
P3, 4
Vertical attenuator
X75-1120-01
P1
"MODE" flexible P.C.B.
J25-2898-03
P27
Horizontal output amp
X74-1230-01
P36
Horizontal mode control
X77-1130-01
P54
"TRIG MODE" flexible P.C.B.
J25-2902-03
P55
"H. DISPLAY" flexible P.C.B.
J25-2900-03
P49
Trig sweep
X74-1320-01
P40 (P41)
Sweep rotary
X74-1310-01
P45
B Trig switch
X77-1120-01
P47
A Trig switch
X77-1110-01

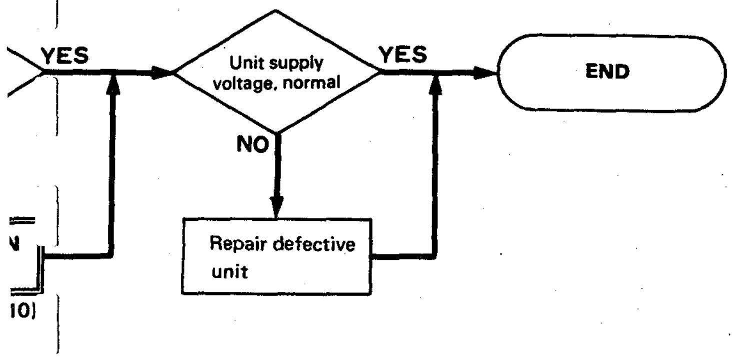

SUPPLY
Input of X68-1310 normal, P30
YES
NO
"Power supply" (W02-0405-15)
Output, normal X68-1310
YES
NO
FOUNDATION VOLTAGE
(X68-1310)
Unit supply voltage, normal
YES
NO
Repair defective unit
END


FOUNDATION VOLTAGE
IC1 Pin 2: 5V
YES
NO
(X68-1310)
IC 1, 2
+ 120 V
YES
NO
IC 1a, Q1, 2, D1
+20V
YES
NO
Q6, 7
+10V
YES
NO
IC2a, Q3, D2
−10V
YES
NO
IC2b, Q4, D3
+ 5.2V
YES
NO
IC 1b, Q5
− 1.6kV
P33, Pin2
YES
NO
Collector signal of Q26: approx. 9V
YES
NO

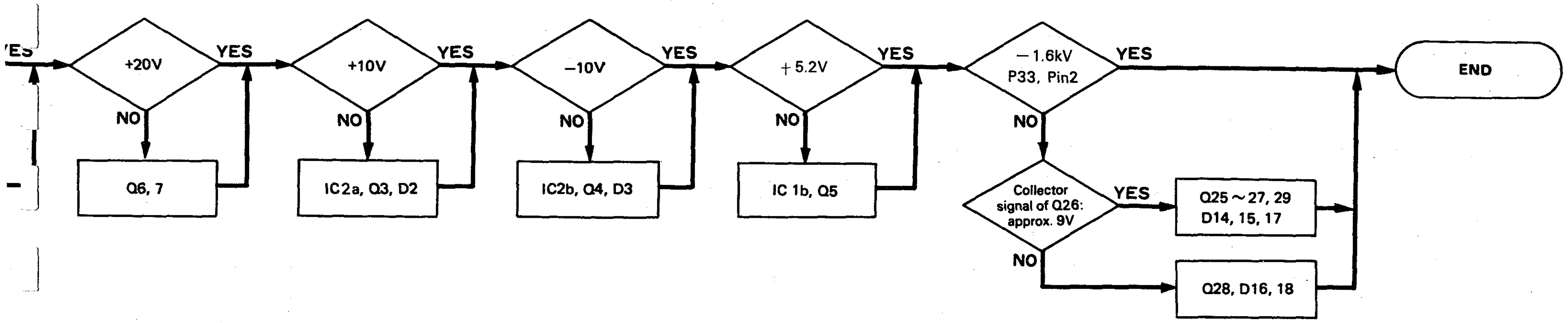
TROUBLESHOOTING



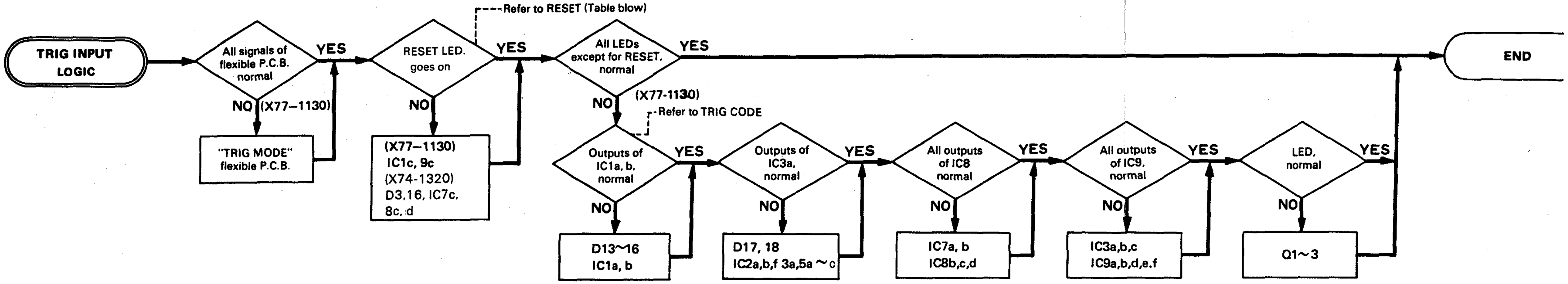
P20
Vertical pre-amp
X73-1320-01
P3, 4
Vertical attenuator
X75-1120-01
P1
"MODE" flexible P.C.B.
J25-2898-03
P36
Horizontal mode control
X77-1130-01
P49
Trig sweep
X74-1320-01
P45
B Trig switch
X77-1120-01
P40 (P41)
Sweep rotary
X74-1310-01
P47
A Trig switch
X77-1110-01
P54
"TRIG MODE" flexible P.C.B.
J25-2902-03
P55
"H. DISPLAY" flexible P.C.B.
J25-2900-03



YES
Unit supply voltage, normal
YES
END
NO
Repair defective unit

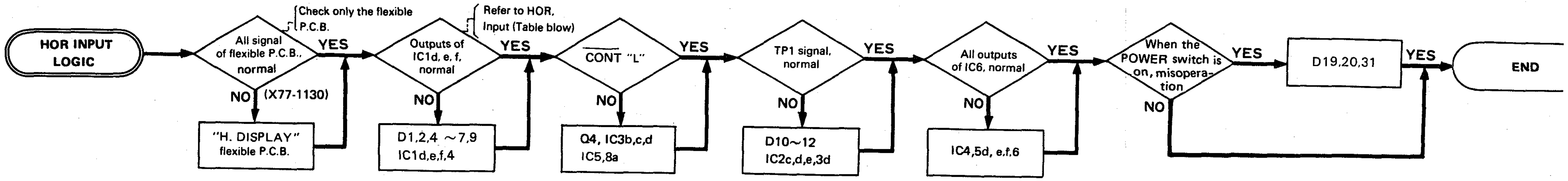


+20V
YES
NO
Q6, 7
+10V
YES
NO
IC2a, Q3, D2
−10V
YES
NO
IC2b, Q4, D3
+5.2V
YES
NO
IC 1b, Q5
−1.6kV P33, Pin2
YES
NO
END
Collector signal of Q26: approx. 9V
YES
Q25 ~ 27, 29 D14, 15, 17
NO
Q28, D16, 18

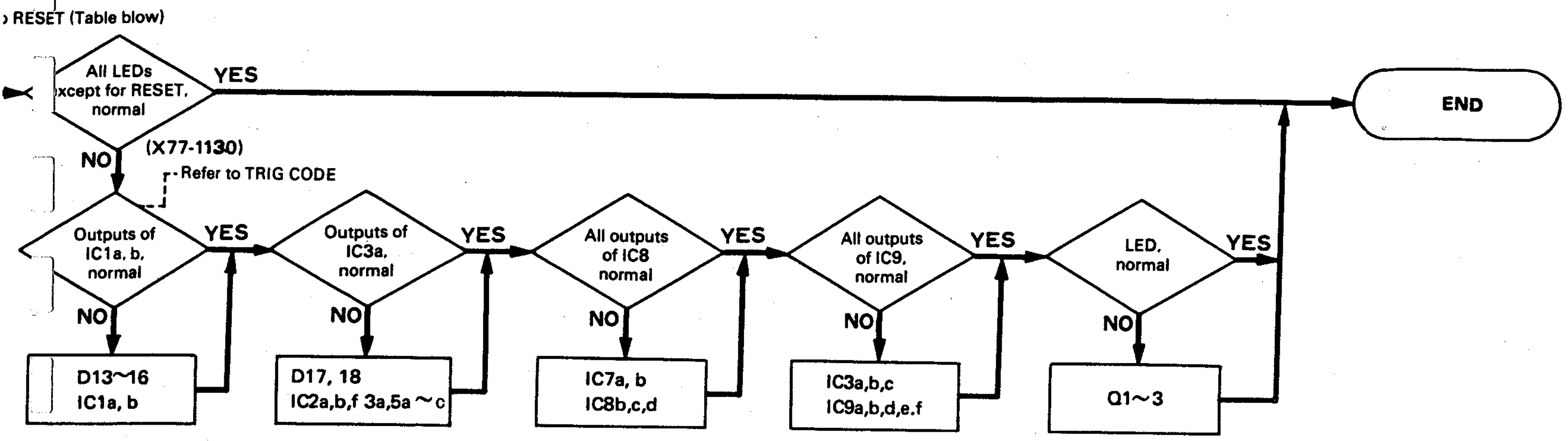

TRIG INPUT LOGIC
All signals of flexible P.C.B. normal
YES
NO
(X77–1130)
"TRIG MODE" flexible P.C.B.
Refer to RESET (Table blow)
RESET LED. goes on
YES
NO
(X77–1130) IC1c, 9c (X74-1320) D3,16, IC7c, 8c, d
All LEDs except for RESET, normal
YES
NO
(X77-1130)
Refer to TRIG CODE
Outputs of IC1a, b, normal
YES
NO
D13~16 IC1a, b
Outputs of IC3a, normal
YES
NO
D17, 18 IC2a,b,f 3a,5a ~c
All outputs of IC8 normal
YES
NO
IC7a, b IC8b,c,d
All outputs of IC9, normal
YES
NO
IC3a,b,c IC9a,b,d,e,f
LED, normal
YES
NO
Q1~3
END

RESET (TRIG MODE "SINGLE")

RESET PUSH (TRIG MODE SINGLE)	Qt	Qt+1	
	P48 10Pin	IC2b 3 Pin	IC3a 3 Pin
	↓	L	L


HOR INPUT LOGIC
Check only the flexible P.C.B.
All signal of flexible P.C.B., normal
YES
NO
(X77-1130)
"H. DISPLAY" flexible P.C.B.
Refer to HOR, Input (Table blow)
Outputs of IC1d, e, f, normal
YES
NO
D1,2,4 ~7,9 IC1d,e,f,4
$\overline{\text{CONT}}$ "L"
YES
NO
Q4, IC3b,c,d IC5,8a
TP1 signal, normal
YES
NO
D10~12 IC2c,d,e,3d
All outputs of IC6, normal
YES
NO
IC4,5d, e,f,6
When the POWER switch is on, misoperation
YES
NO
D19,20,31
YES
END

TROUBLESHOOTING


RESET (Table blow)
All LEDs xcept for RESET, normal
YES
END
NO
(X77-1130)
Refer to TRIG CODE
Outputs of IC1a, b, normal
YES
NO
D13~16 IC1a, b
Outputs of IC3a, normal
YES
NO
D17, 18 IC2a,b,f 3a,5a ~ c
All outputs of IC8 normal
YES
NO
IC7a, b IC8b,c,d
All outputs of IC9, normal
YES
NO
IC3a,b,c IC9a,b,d,e.f
LED, normal
YES
NO
Q1~3

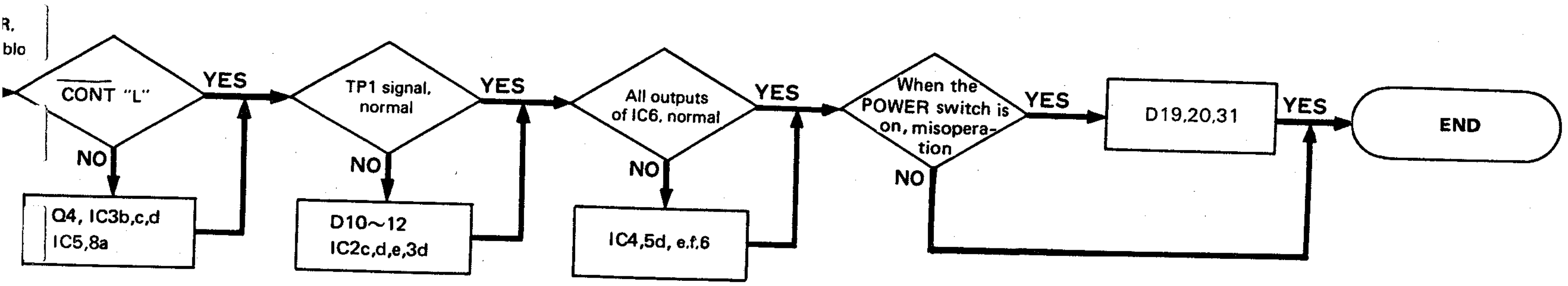
RESET (TRIG MODE "SINGLE")

RESET PUSH (TRIG MODE SINGLE)	Qt	Qt+1	
	P48 10Pin	IC2b 3 Pin	IC3a 3 Pin
	↓	L	L

TRIG CODE

TRIG MODE PUSH	Qt			Qt+1											
	IC1		IC3	IC7				IC8-4 IC5-3	IC8-11 IC5-5	IC8-10 IC5-7	IC9				
	4 Pin	2 Pin	3 Pin	13 Pin	12 Pin	1 Pin	2 Pin				8 Pin	10 Pin	12 Pin	4 Pin	2 Pin
AUTO	↑	L	↑	H	L	L	H	L	H	H	H	L	L	H	H
NORM	L	↑	↑	L	H	H	L	H	L	H	L	H	L	L	H
SINGLE	↑	↑	↑	H	L	H	L	H	H	L	L	L	H	H	L

Qt : Logical value when the switch is depressed.
Qt + 1 : Logical value after the switch is depressed.

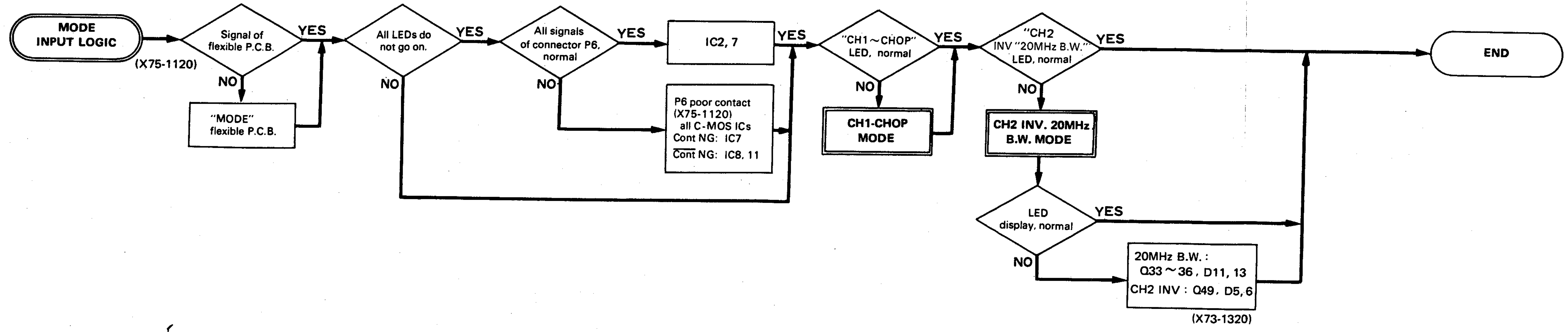

R, blo
CONT "L"
YES
NO
Q4, IC3b,c,d IC5,8a
TP1 signal, normal
YES
NO
D10~12 IC2c,d,e,3d
All outputs of IC6, normal
YES
NO
IC4,5d, e.f,6
When the POWER switch is on, misoperation
YES
NO
D19,20,31
YES
END

HOR. INPUT

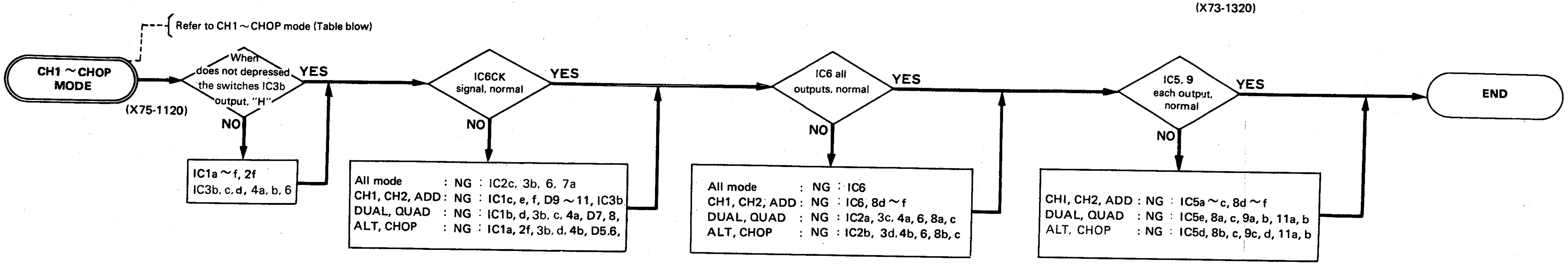
H. DISPLAY PUSH	Qt				Qt+1										
	IC1 OUTPUT			TP1	IC5 1 pin 15 pin	IC4 2 pin IC5 13pin	IC4 5 pin IC5 11 pin	IC4 7pin IC5 9 pin	IC6 OUTPUT						
	12f	10e	8 d						2	3	4	5	6	7	OTHER OUTPUT
A	L	L	↑	↑	L	L	L	H	L	H	H	H	H	H	H
ALT	L	↑	L	↑	L	L	H	L	H	L	H	H	H	H	H
A-INT-B	L	↑	↑	↑	L	L	H	H	H	H	L	H	H	H	H
B	↑	L	L	↑	L	H	L	L	H	H	H	L	H	H	H
X-Y	↑	↑	L	↑	L	H	H	L	H	H	H	H	H	L	H

Qt : Logical value when the switch is depressed.
Qt + 1 : Logical value after the switch is depressed.

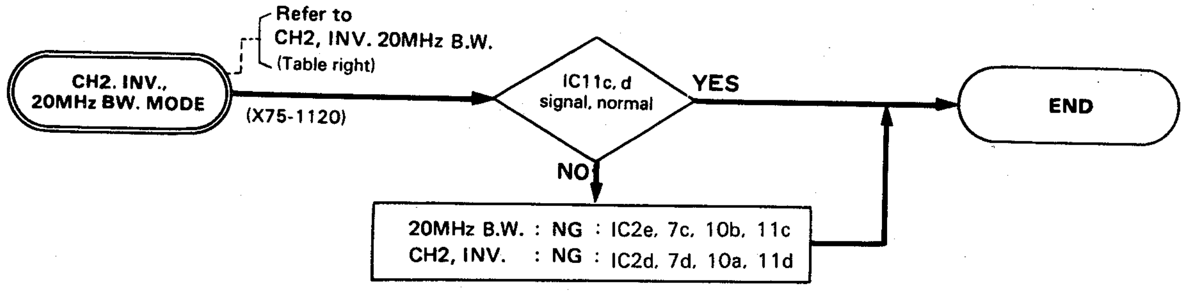
TROUBLESHOOTING



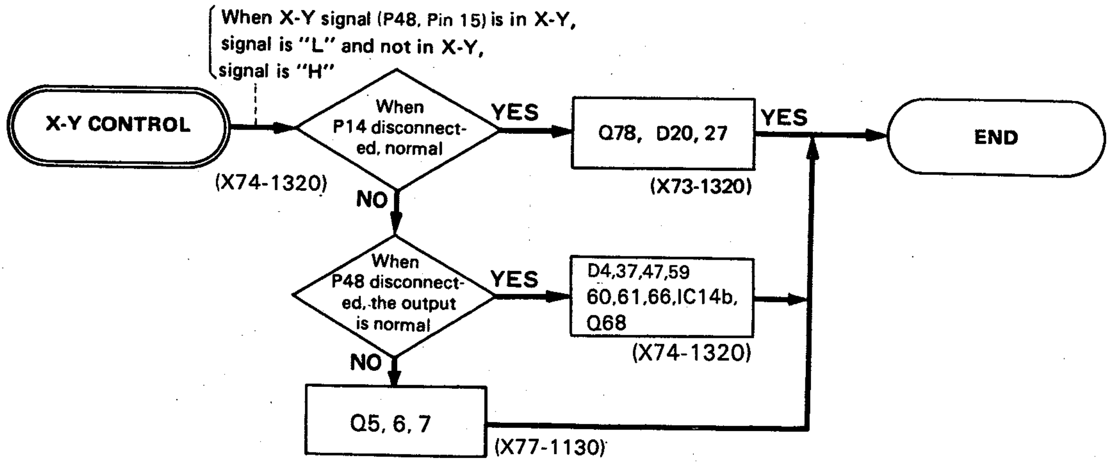
MODE INPUT LOGIC
(X75-1120)
Signal of flexible P.C.B.
YES
NO
"MODE" flexible P.C.B.
All LEDs do not go on.
YES
NO
All signals of connector P6, normal
YES
NO
IC2, 7
P6 poor contact (X75-1120) all C-MOS ICs Cont NG: IC7 Cont NG: IC8, 11
YES
"CH1~CHOP" LED, normal
YES
NO
CH1-CHOP MODE
"CH2 INV "20MHz B.W."" LED, normal
YES
NO
CH2 INV. 20MHz B.W. MODE
LED display, normal
YES
NO
20MHz B.W. : Q33~36, D11, 13
CH2 INV : Q49, D5, 6
(X73-1320)
END



Refer to CH1~CHOP mode (Table blow)
CH1~CHOP MODE
(X75-1120)
When does not depressed the switches IC3b output, "H"
YES
NO
IC1a~f, 2f
IC3b, c, d, 4a, b, 6
IC6CK signal, normal
YES
NO
All mode : NG : IC2c, 3b, 6, 7a
CH1, CH2, ADD : NG : IC1c, e, f, D9~11, IC3b
DUAL, QUAD : NG : IC1b, d, 3b, c, 4a, D7, 8,
ALT, CHOP : NG : IC1a, 2f, 3b, d, 4b, D5.6,
IC6 all outputs, normal
YES
NO
All mode : NG : IC6
CH1, CH2, ADD : NG : IC6, 8d~f
DUAL, QUAD : NG : IC2a, 3c, 4a, 6, 8a, c
ALT, CHOP : NG : IC2b, 3d, 4b, 6, 8b, c
IC5, 9 each output, normal
YES
NO
CHI, CH2, ADD : NG : IC5a~c, 8d~f
DUAL, QUAD : NG : IC5e, 8a, c, 9a, b, 11a, b
ALT, CHOP : NG : IC5d, 8b, c, 9c, d, 11a, b
END



Refer to CH2, INV. 20MHz B.W. (Table right)
CH2. INV., 20MHz BW. MODE
(X75-1120)
IC11c, d signal, normal
YES
NO
20MHz B.W. : NG : IC2e, 7c, 10b, 11c
CH2, INV. : NG : IC2d, 7d, 10a, 11d
END



When X-Y signal (P48, Pin 15) is in X-Y, signal is "L" and not in X-Y, signal is "H"
X-Y CONTROL
(X74-1320)
When P14 disconnected, normal
YES
NO
Q78, D20, 27
(X73-1320)
YES
When P48 disconnected, the output is normal
YES
NO
D4,37,47,59 60,61,66,IC14b, Q68
(X74-1320)
Q5, 6, 7
(X77-1130)
END

CH2 INV.

	Qt	Qt + I
CH2 INV PUSH	IC10a INPUT	IC10a OUTPUT
	(T)	(Qa)
	↑	$\overline{Qat}$

20MHz B.W.

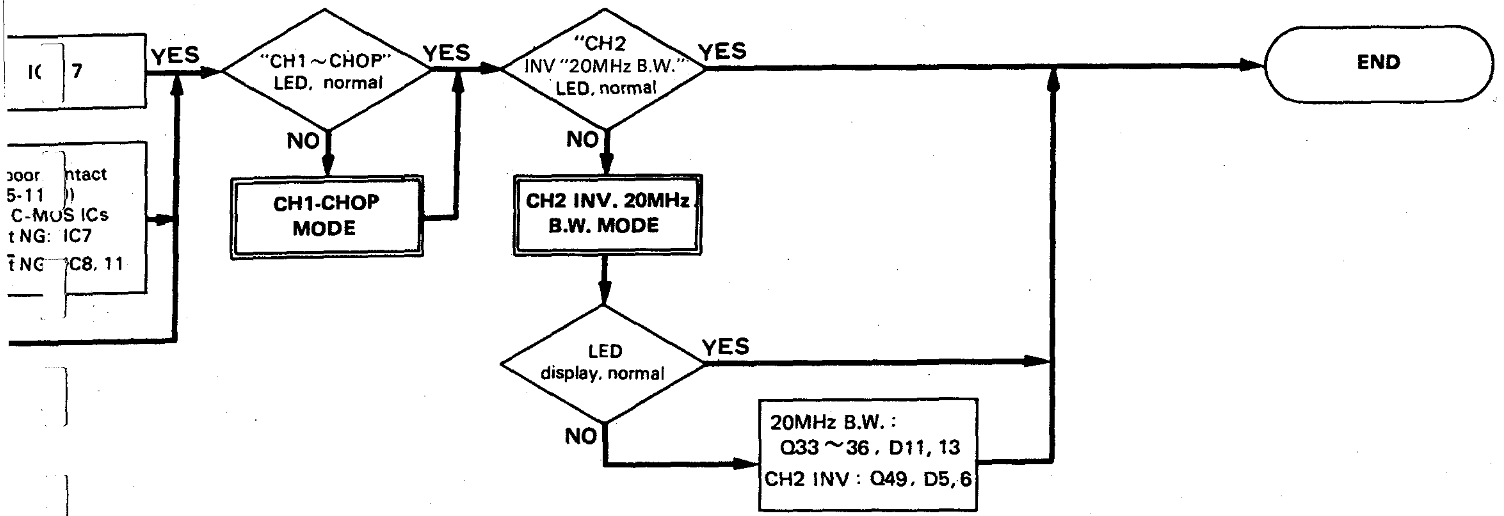
	Qt	Qt + I
20MHz B.W PUSH	IC 10b INPUT	IC10b OUTPUT
	(T)	(Qb)
	↑	$\overline{Qbt}$

CH1~CHOP MODE

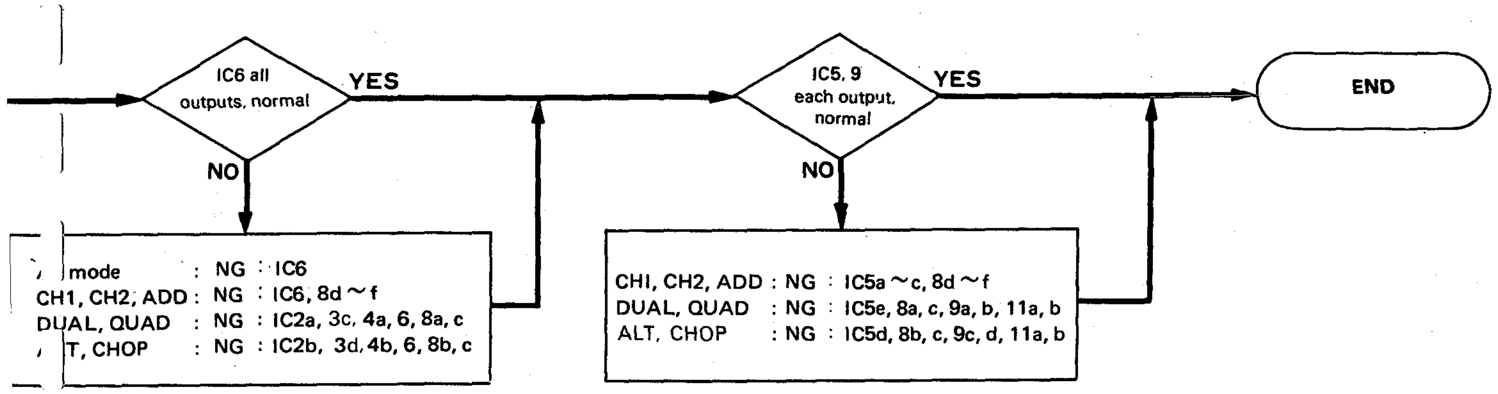
"MODE" PUSH	Qt				
	IC3b IN／OUT			IC6 CK	
	IN Pin 5	IN Pin 6	OUT Pin 4		Q5
CHI	L	↑	↓	↑	H
CH2	L	↑	↓	↑	L
DUAL	↑	L	↓	↑	L
ADD	L	↑	↓	↑	L
QUAD	↑	L	↓	↑	L
ALT	↑	L	↓	↑	L
CHOP	↑	L	↓	↑	L

Qt : Logical value when the switch is dep
Qt + 1 : Logical value after the switch is depr
Qkt : Indicates that Qkt which is the logica
depressed is output when the switch

TROUBLESHOOTING


IC 7
YES
poor ntact
5-11)
C-MOS ICs
t NG: IC7
t̄ NG C8, 11
"CH1~CHOP" LED, normal
YES
NO
CH1-CHOP MODE
"CH2 INV "20MHz B.W." LED, normal
YES
NO
CH2 INV. 20MHz B.W. MODE
END
LED display, normal
YES
NO
20MHz B.W. : Q33~36, D11, 13
CH2 INV : Q49, D5, 6

(X73-1320)


IC6 all outputs, normal
YES
NO
mode : NG : IC6
CH1, CH2, ADD : NG : IC6, 8d~f
DUAL, QUAD : NG : IC2a, 3c, 4a, 6, 8a, c
T, CHOP : NG : IC2b, 3d, 4b, 6, 8b, c
IC5, 9 each output, normal
YES
NO
CHI, CH2, ADD : NG : IC5a~c, 8d~f
DUAL, QUAD : NG : IC5e, 8a, c, 9a, b, 11a, b
ALT, CHOP : NG : IC5d, 8b, c, 9c, d, 11a, b
END

CH2 INV.

	Qt	Qt + I
CH2 INV PUSH	IC10a INPUT	IC10a OUTPUT
	(T)	(Qa)
	↑	$\overline{Qat}$

20MHz B.W.

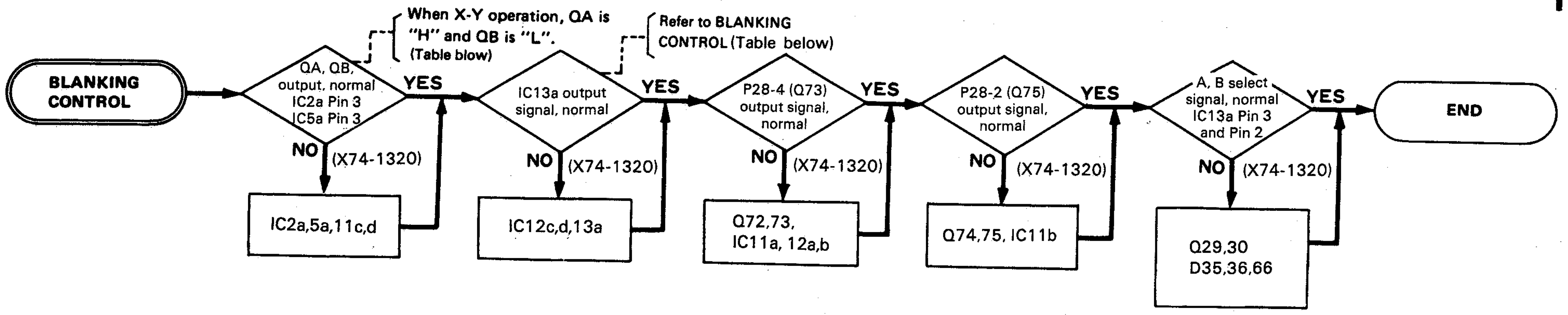
	Qt	Qt + I
20MHz B.W PUSH	IC 10b INPUT	IC10b OUTPUT
	(T)	(Qb)
	↑	$\overline{Qbt}$

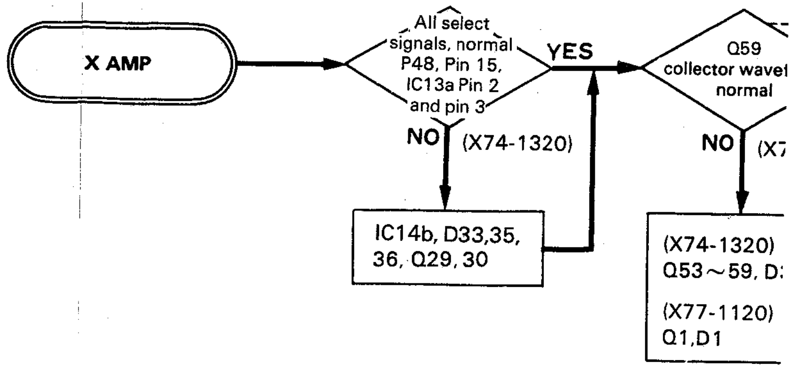
CH1~CHOP MODE

"MODE" PUSH	Qt				Qt+I														
	IC3b IN/OUT			IC6	CHI/CH2/ADD						IC6	DUAL/QUAD				ALT/CHOP			
	IN Pin 5	IN Pin 6	OUT Pin 4	CK	IC6			IC5			Q2	IC4a Qa	IC6 Qo	IC9 OUTPUT		IC4b Qb	IC6 QI	IC9 OUTPUT	
					Q5	Q4	Q3	a	b	c				b	a			c	d
CHI	L	↑	↓	↑	H	L	L	L	H	H	H	Qat	Qat	H	H	Qbt	Qbt	H	H
CH2	L	↑	↓	↑	L	H	L	H	L	H	H	Qat	Qat	H	H	Qbt	Qbt	H	H
DUAL	↑	L	↓	↑	L	L	L	H	H	H	L	L	L	L	H	Qbt	Qbt	QIt	QIt
ADD	L	↑	↓	↑	L	L	H	H	H	L	H	Qat	Qat	H	H	Qbt	Qbt	H	H
QUAD	↑	L	↓	↑	L	L	L	H	H	H	L	H	H	H	L	Qbt	Qbt	QIt	QIt
ALT	↑	L	↓	↑	L	L	L	H	H	H	L	Qat	Qat	Qot	$\overline{Qot}$	H	L	L	H
CHOP	↑	L	↓	↑	L	L	L	H	H	H	L	Qat	Qat	Qot	$\overline{Qot}$	L	H	H	L

Qt : Logical value when the switch is depressed.
Qt + 1 : Logical value after the switch is depressed.
Qkt : Indicates that Qkt which is the logical value before the switch is depressed is output when the switch is depressed.

TROUBLESHOOTING


BLANKING CONTROL
When X-Y operation, QA is "H" and QB is "L". (Table blow)
QA, QB, output, normal IC2a Pin 3 IC5a Pin 3
YES
NO (X74-1320)
IC2a,5a,11c,d
Refer to BLANKING CONTROL (Table below)
IC13a output signal, normal
YES
NO (X74-1320)
IC12c,d,13a
P28-4 (Q73) output signal, normal
YES
NO (X74-1320)
Q72,73, IC11a, 12a,b
P28-2 (Q75) output signal, normal
YES
NO (X74-1320)
Q74,75, IC11b
A, B select signal, normal IC13a Pin 3 and Pin 2
YES
NO (X74-1320)
Q29,30 D35,36,66
END


X AMP
All select signals, normal P48, Pin 15, IC13a Pin 2 and pin 3
YES
NO (X74-1320)
IC14b, D33,35, 36, Q29, 30
Q59 collector wavef normal
NO (X7
(X74-1320) Q53~59, D:
(X77-1120) Q1,D1

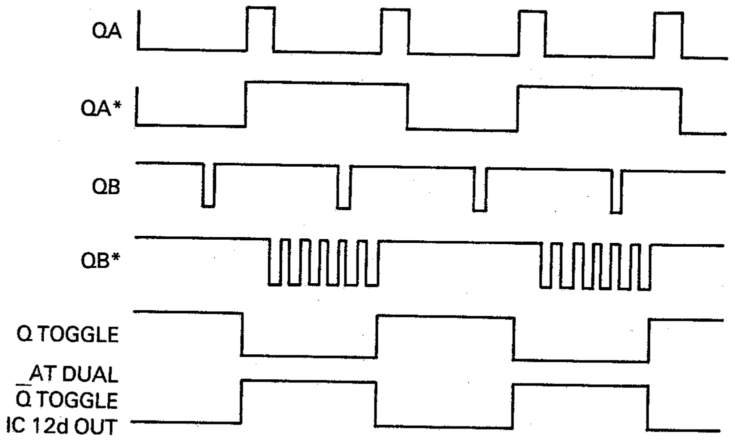
BLANKING CONTROL

H DISPLAY	P48 X-Y BUFFER 15Pin	IC13a				IC12d	P28	
		IN		OUT		OUT	A. blank-ing 4 Pin	B. blank-ing 2 Pin
		S	R	Q	$\overline{Q}$			
A	H	H	L	H	L	H	QA	H
ALT	H	L	L	TOGGLE		H	QA*	QB
A-INT-B	H	H	L	H	L	H	QA	QB
B-DLY'D	H	L	H	L	H	H	H	QB
X-Y	L	H	L	H	L	H	L	H

*1 Complex waveform IC 11b and QA signals.

*2 Complex waveform IC11b output. When CHOP operation, output of P28 is complex CHOP signal waveform.

The $\overline{QA}$ and $\overline{QB}$ in the table show the reverse phase of QA and AB described .


QA
QA*
QB
QB*
Q TOGGLE
AT DUAL
$\overline{Q}$ TOGGLE
IC 12d OUT

RELATIONSHIP BETWEEN A, B SWEEP AND QA, QB

<

IC2a 3 Pin

IC5a 3 Pin

IC13a Q

IC13a $\overline{Q}$

IC12d

Q73 (E)

Q75 (E)

<

IC2a 3 Pin

IC5a 3 Pin

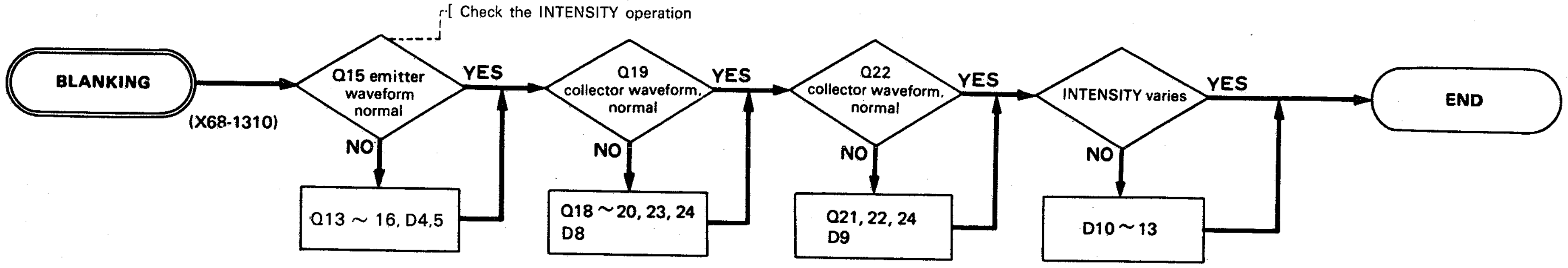
IC13a Q

IC13a $\overline{Q}$

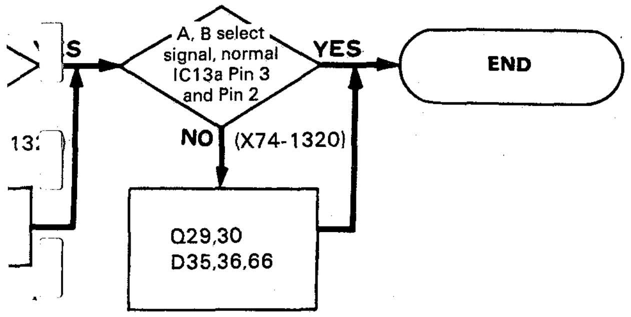
IC12d

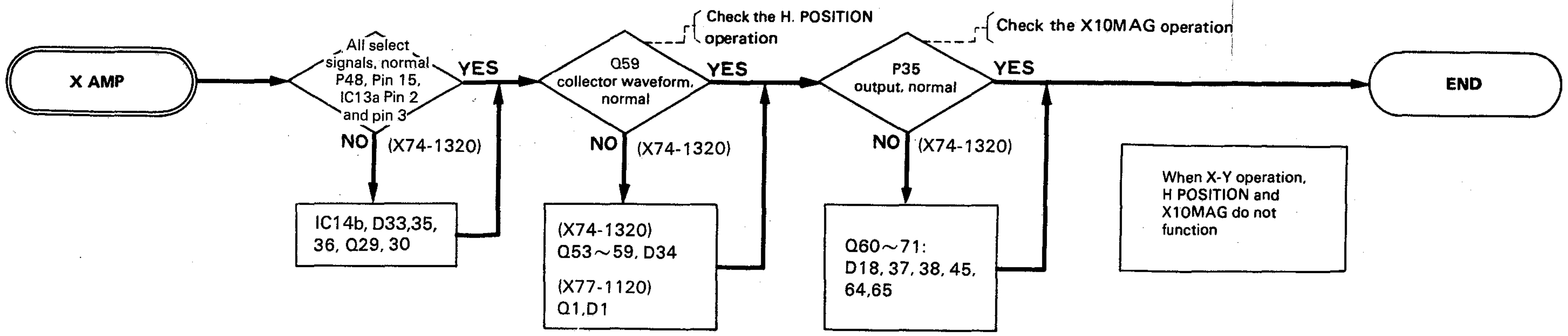
Q73

Q75

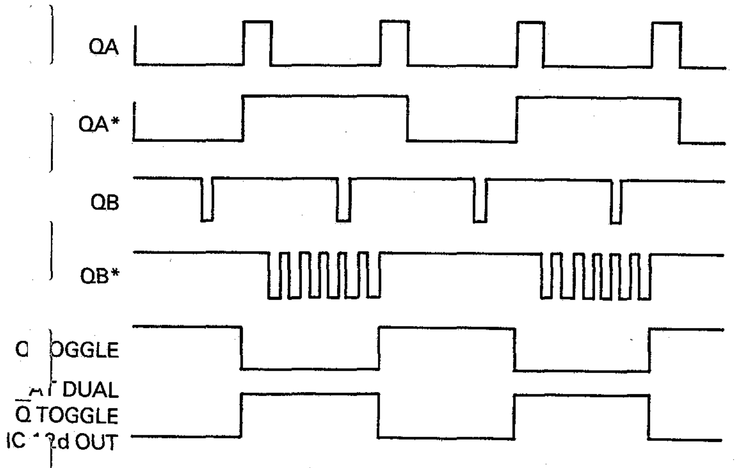

Check the INTENSITY operation
BLANKING
(X68-1310)
Q15 emitter waveform normal
YES
NO
Q13 ~ 16, D4,5
Q19 collector waveform, normal
YES
NO
Q18 ~20, 23, 24 D8
Q22 collector waveform, normal
YES
NO
Q21, 22, 24 D9
INTENSITY varies
YES
NO
D10 ~ 13
END

TROUBLESHOOTING

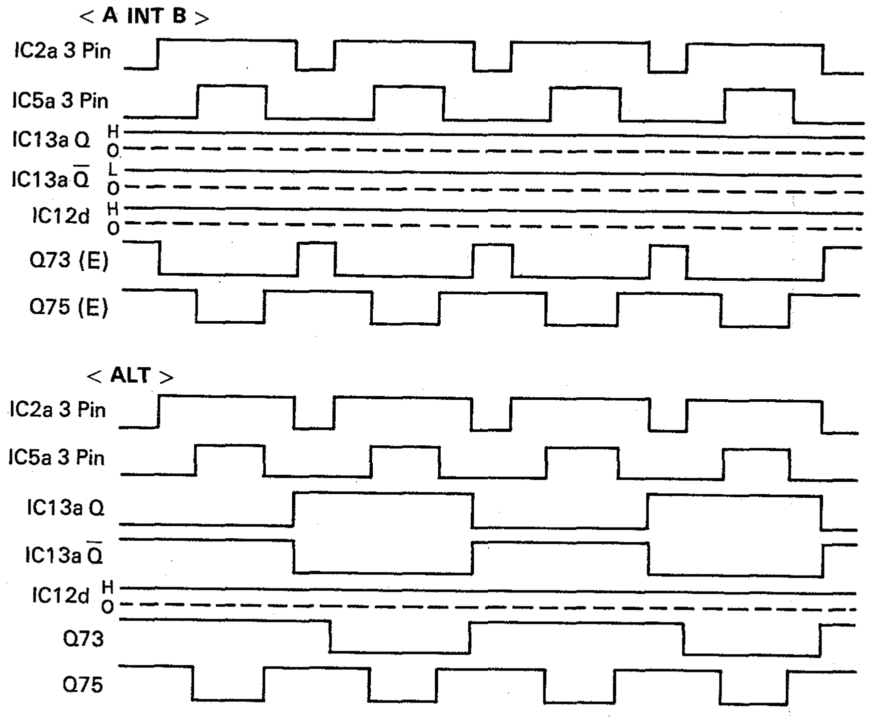

S
13
A, B select signal, normal IC13a Pin 3 and Pin 2
YES
END
NO
(X74-1320)
Q29,30
D35,36,66


X AMP
All select signals, normal P48, Pin 15, IC13a Pin 2 and pin 3
YES
NO
(X74-1320)
IC14b, D33,35, 36, Q29, 30
Check the H. POSITION operation
Q59 collector waveform, normal
YES
NO
(X74-1320)
(X74-1320)
Q53~59, D34
(X77-1120)
Q1,D1
Check the X10MAG operation
P35 output, normal
YES
NO
(X74-1320)
Q60~71:
D18, 37, 38, 45, 64,65
END

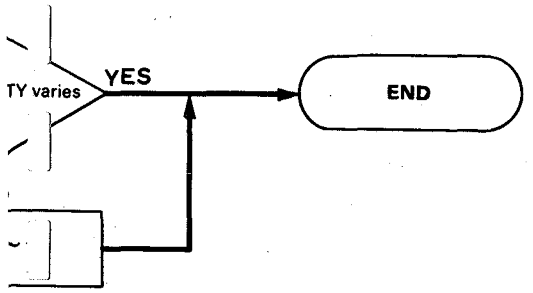
When X-Y operation, H POSITION and X10MAG do not function


QA
QA*
QB
QB*
OGGLE
DUAL
Q TOGGLE
IC d OUT

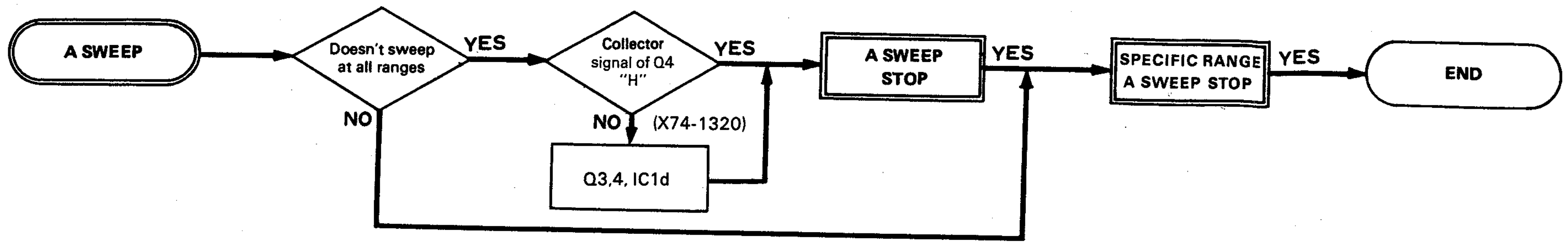
RELATIONSHIP BETWEEN A, B SWEEP AND QA, QB

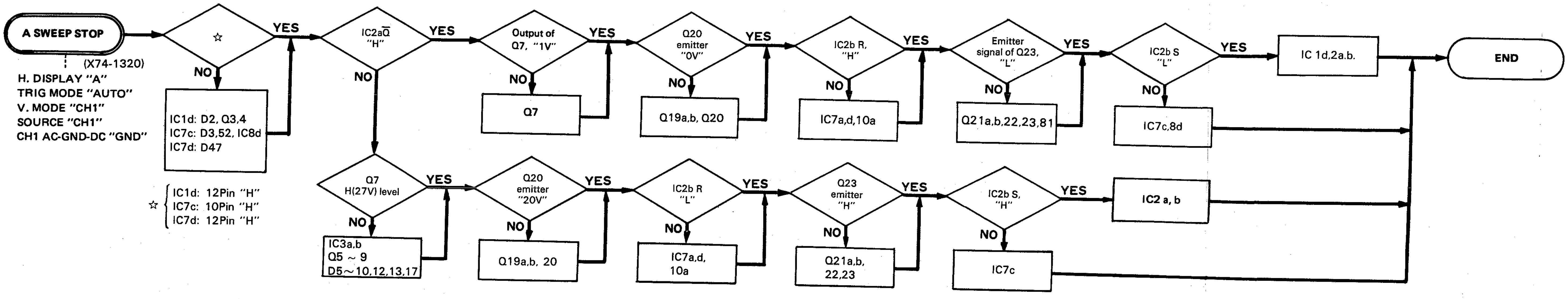

< A INT B >
IC2a 3 Pin
IC5a 3 Pin
IC13a Q H O
IC13a Q̄ L O
IC12d H O
Q73 (E)
Q75 (E)
< ALT >
IC2a 3 Pin
IC5a 3 Pin
IC13a Q
IC13a Q̄
IC12d H O
Q73
Q75

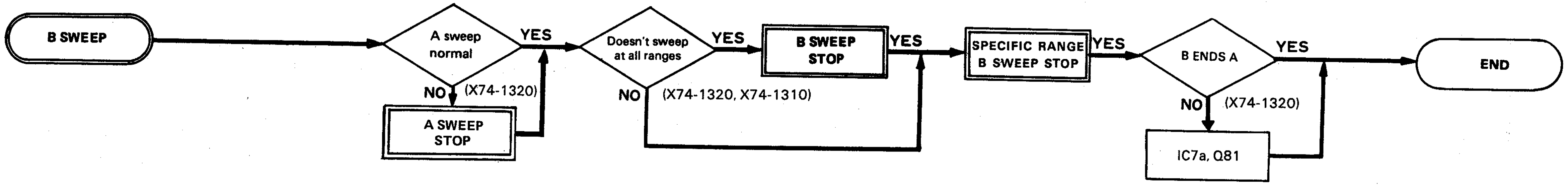
BLANKING CONTROL

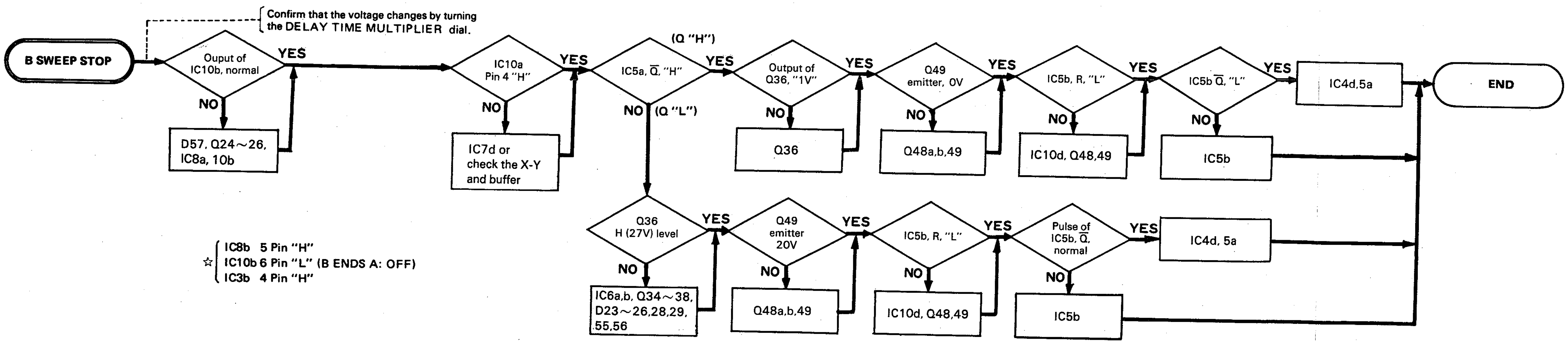

TY varies
YES
END

TROUBLESHOOTING

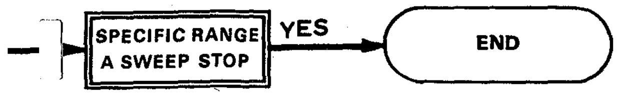

A SWEEP
Doesn't sweep at all ranges
YES
NO
Collector signal of Q4 "H"
YES
NO
(X74-1320)
Q3,4, IC1d
A SWEEP STOP
YES
SPECIFIC RANGE A SWEEP STOP
YES
END

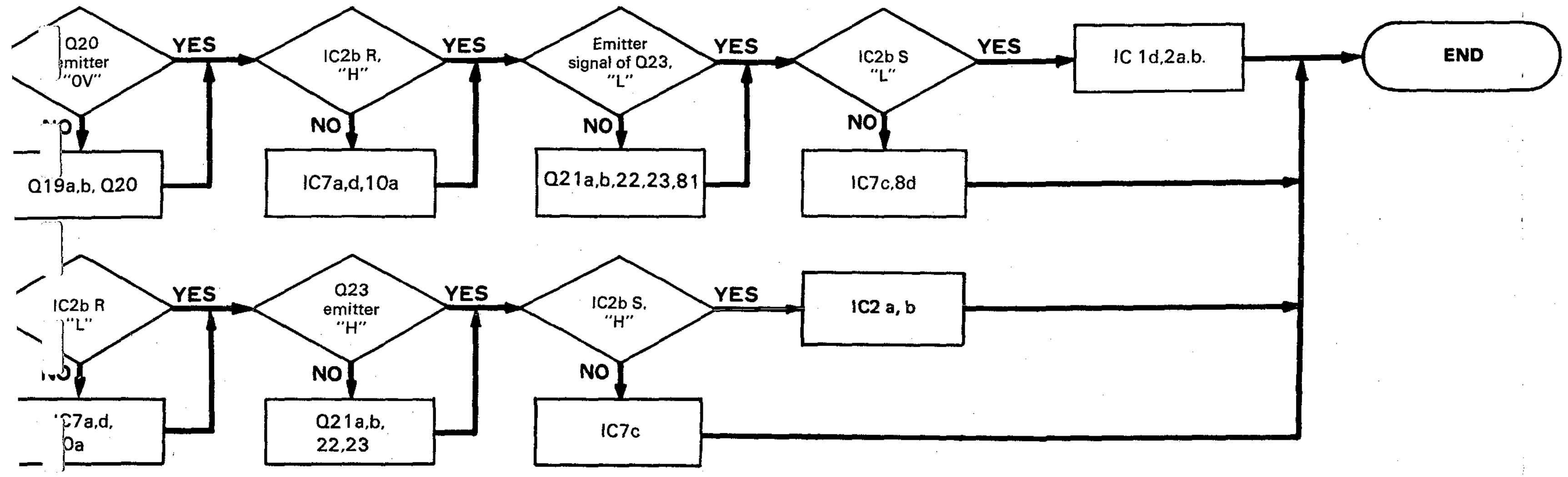

A SWEEP STOP
(X74-1320)
H. DISPLAY "A"
TRIG MODE "AUTO"
V. MODE "CH1"
SOURCE "CH1"
CH1 AC-GND-DC "GND"
☆
YES
NO
IC1d: D2, Q3,4
IC7c: D3,52, IC8d
IC7d: D47
☆ IC1d: 12Pin "H"
IC7c: 10Pin "H"
IC7d: 12Pin "H"
IC2aQ̄ "H"
YES
NO
Output of Q7, "1V"
YES
NO
Q7
Q20 emitter "0V"
YES
NO
Q19a,b, Q20
IC2b R, "H"
YES
NO
IC7a,d,10a
Emitter signal of Q23, "L"
YES
NO
Q21a,b,22,23,81
IC2b S "L"
YES
NO
IC7c,8d
IC 1d,2a.b.
END
Q7 H(27V) level
YES
NO
IC3a,b
Q5 ~ 9
D5~10,12,13,17
Q20 emitter "20V"
YES
NO
Q19a,b, 20
IC2b R "L"
YES
NO
IC7a,d, 10a
Q23 emitter "H"
YES
NO
Q21a,b, 22,23
IC2b S, "H"
YES
NO
IC7c
IC2 a, b

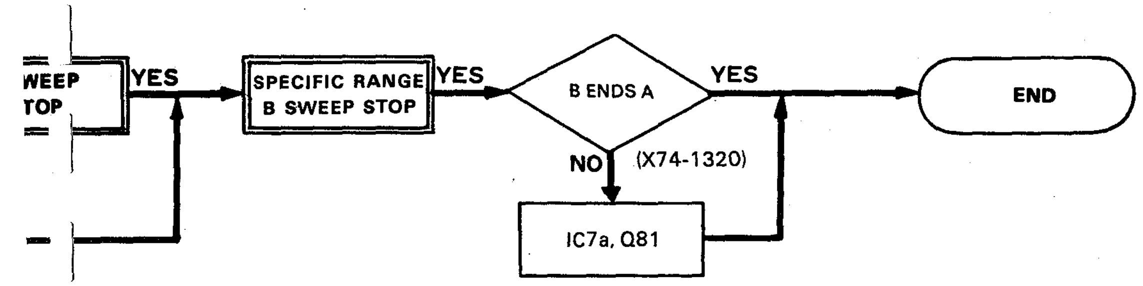

B SWEEP
A sweep normal
YES
NO
(X74-1320)
A SWEEP STOP
Doesn't sweep at all ranges
YES
NO
(X74-1320, X74-1310)
B SWEEP STOP
YES
SPECIFIC RANGE B SWEEP STOP
YES
B ENDS A
YES
NO
(X74-1320)
IC7a, Q81
END

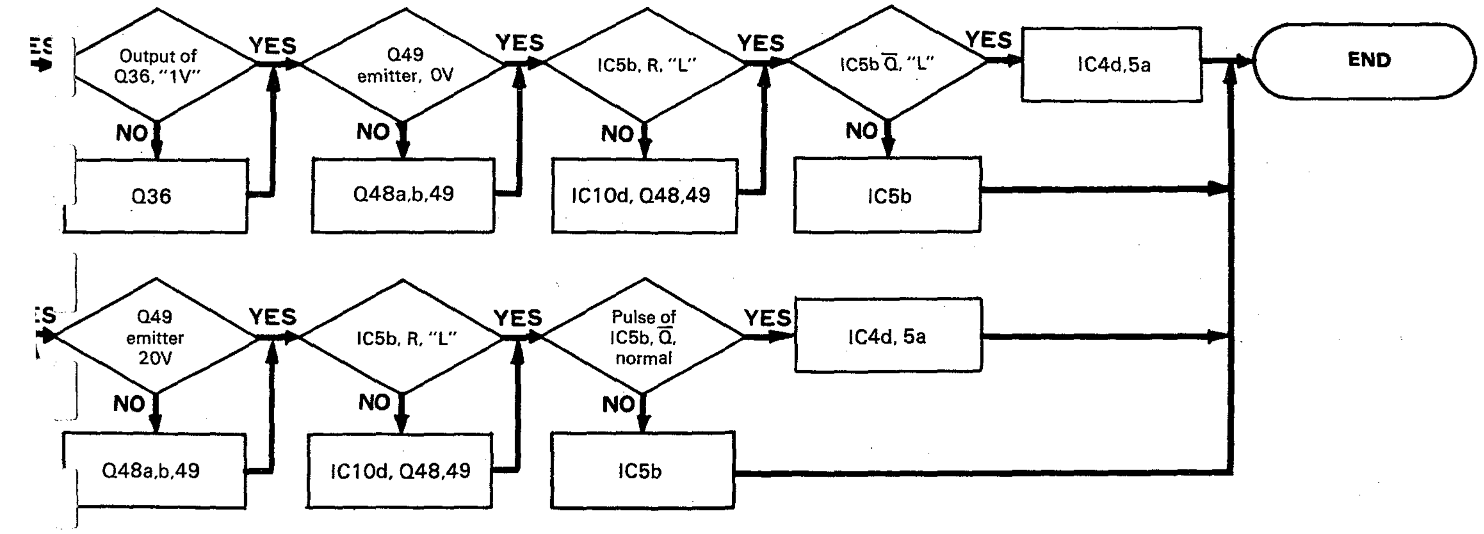

Confirm that the voltage changes by turning the DELAY TIME MULTIPLIER dial.
B SWEEP STOP
Ouput of IC10b, normal
YES
NO
D57, Q24~26, IC8a, 10b
☆ IC8b 5 Pin "H"
IC10b 6 Pin "L" (B ENDS A: OFF)
IC3b 4 Pin "H"
IC10a Pin 4 "H"
YES
NO
IC7d or check the X-Y and buffer
(Q "H")
IC5a, Q̄, "H"
YES
NO
(Q "L")
Output of Q36, "1V"
YES
NO
Q36
Q49 emitter, 0V
YES
NO
Q48a,b,49
IC5b, R, "L"
YES
NO
IC10d, Q48,49
IC5b Q̄, "L"
YES
NO
IC5b
IC4d,5a
END
Q36 H (27V) level
YES
NO
IC6a,b, Q34~38, D23~26,28,29, 55,56
Q49 emitter 20V
YES
NO
Q48a,b,49
IC5b, R, "L"
YES
NO
IC10d, Q48,49
Pulse of IC5b, Q̄, normal
YES
NO
IC5b
IC4d, 5a

TROUBLESHOOTING

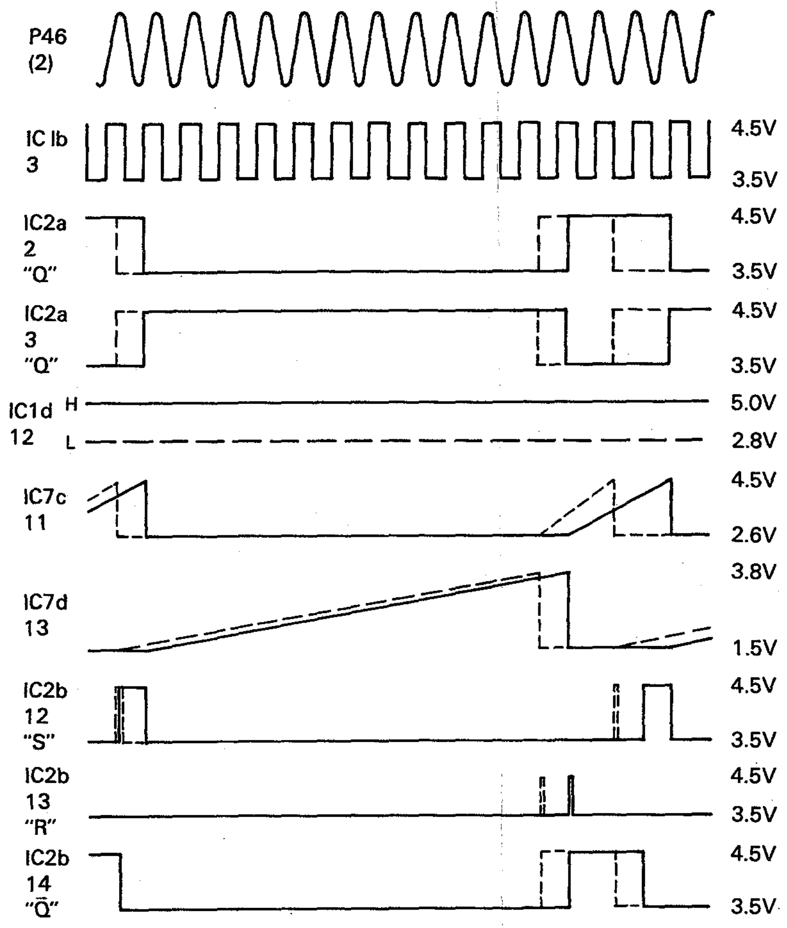

SPECIFIC RANGE A SWEEP STOP
YES
END


Q20 emitter "0V"
YES
NO
Q19a,b, Q20
IC2b R, "H"
YES
NO
IC7a,d,10a
Emitter signal of Q23, "L"
YES
NO
Q21a,b,22,23,81
IC2b S "L"
YES
NO
IC7c,8d
IC 1d,2a.b.
END
IC2b R "L"
YES
NO
IC7a,d, 10a
Q23 emitter "H"
YES
NO
Q21a,b, 22,23
IC2b S, "H"
YES
NO
IC7c
IC2 a, b

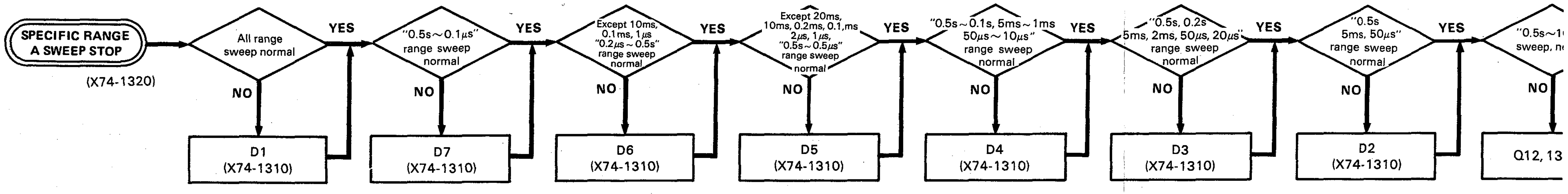

SWEEP STOP
YES
SPECIFIC RANGE B SWEEP STOP
YES
B ENDS A
YES
END
NO
(X74-1320)
IC7a, Q81

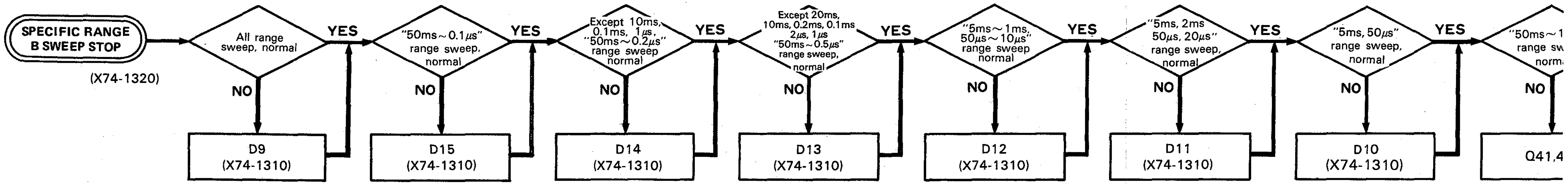

Output of Q36, "1V"
YES
NO
Q36
Q49 emitter, 0V
YES
NO
Q48a,b,49
IC5b, R, "L"
YES
NO
IC10d, Q48,49
IC5b Q̄, "L"
YES
NO
IC5b
IC4d,5a
END
Q49 emitter 20V
YES
NO
Q48a,b,49
IC5b, R, "L"
YES
NO
IC10d, Q48,49
Pulse of IC5b, Q̄, normal
YES
NO
IC5b
IC4d, 5a

Waveform in Sweep circuit (X74-1320-01)
(Input signal 1 kHz, SWEEP TIME 1 ms/div)

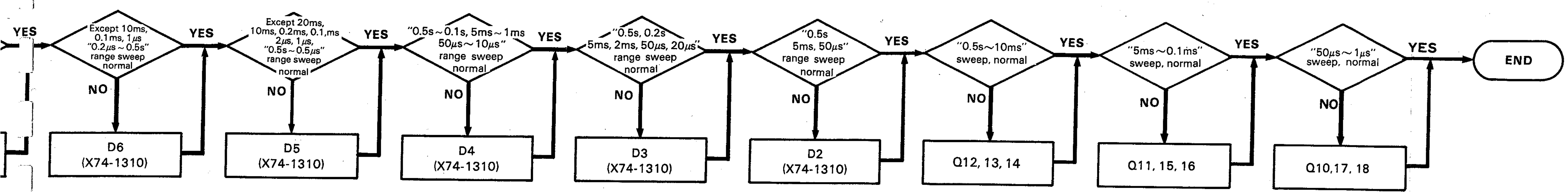

P46 (2)
IC Ib 3
4.5V
3.5V
IC2a 2 "Q"
4.5V
3.5V
IC2a 3 "Q̄"
4.5V
3.5V
IC1d 12
H
L
5.0V
2.8V
IC7c 11
4.5V
2.6V
IC7d 13
3.8V
1.5V
IC2b 12 "S"
4.5V
3.5V
IC2b 13 "R"
4.5V
3.5V
IC2b 14 "Q̄"
4.5V
3.5V

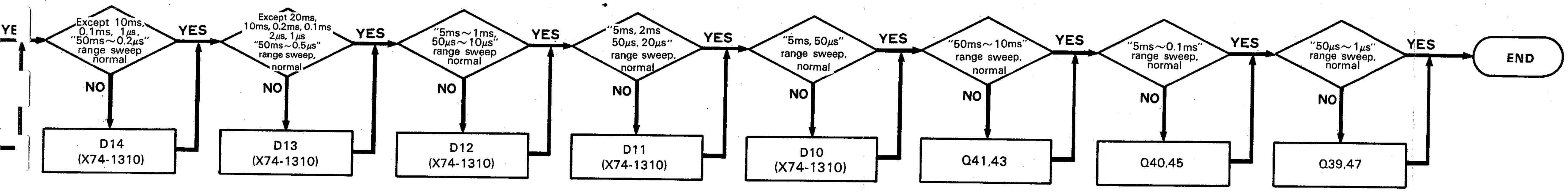
Broke-line auto free run
(at non-signal)


SPECIFIC RANGE A SWEEP STOP
(X74-1320)
All range sweep normal
YES
NO
D1 (X74-1310)
"0.5s~0.1μs" range sweep normal
D7 (X74-1310)
Except 10ms, 0.1ms, 1μs "0.2μs~0.5s" range sweep normal
D6 (X74-1310)
Except 20ms, 10ms, 0.2ms, 0.1,ms 2μs, 1μs, "0.5s~0.5μs" range sweep normal
D5 (X74-1310)
"0.5s~0.1s, 5ms~1ms 50μs~10μs" range sweep normal
D4 (X74-1310)
"0.5s, 0.2s 5ms, 2ms, 50μs, 20μs" range sweep normal
D3 (X74-1310)
"0.5s 5ms, 50μs" range sweep normal
D2 (X74-1310)
"0.5s~1
sweep, n
Q12, 13

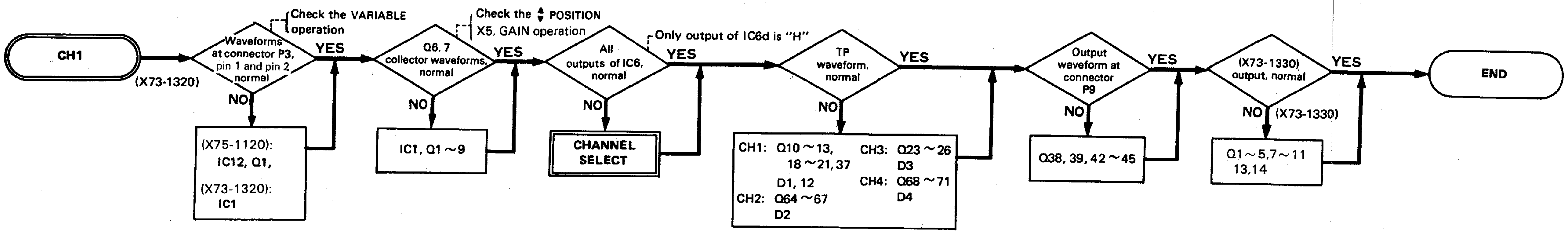

SPECIFIC RANGE B SWEEP STOP
(X74-1320)
All range sweep, normal
YES
NO
D9 (X74-1310)
"50ms~0.1μs" range sweep, normal
D15 (X74-1310)
Except 10ms, 0.1ms, 1μs, "50ms~0.2μs" range sweep normal
D14 (X74-1310)
Except 20ms, 10ms, 0.2ms, 0.1ms 2μs, 1μs "50ms~0.5μs" range sweep, normal
D13 (X74-1310)
"5ms~1ms, 50μs~10μs" range sweep normal
D12 (X74-1310)
"5ms, 2ms 50μs, 20μs" range sweep, normal
D11 (X74-1310)
"5ms, 50μs" range sweep, normal
D10 (X74-1310)
"50ms~1
range sw
norm
Q41,4

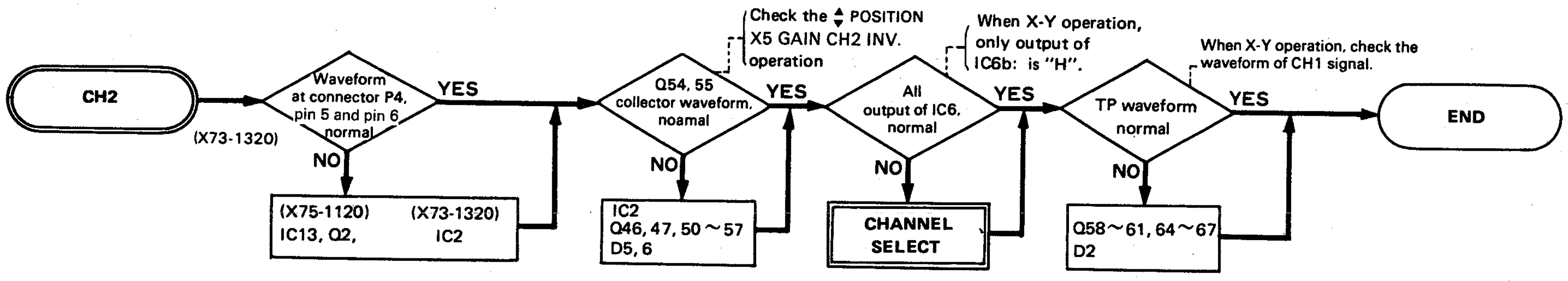
TROUBLESHOOTING

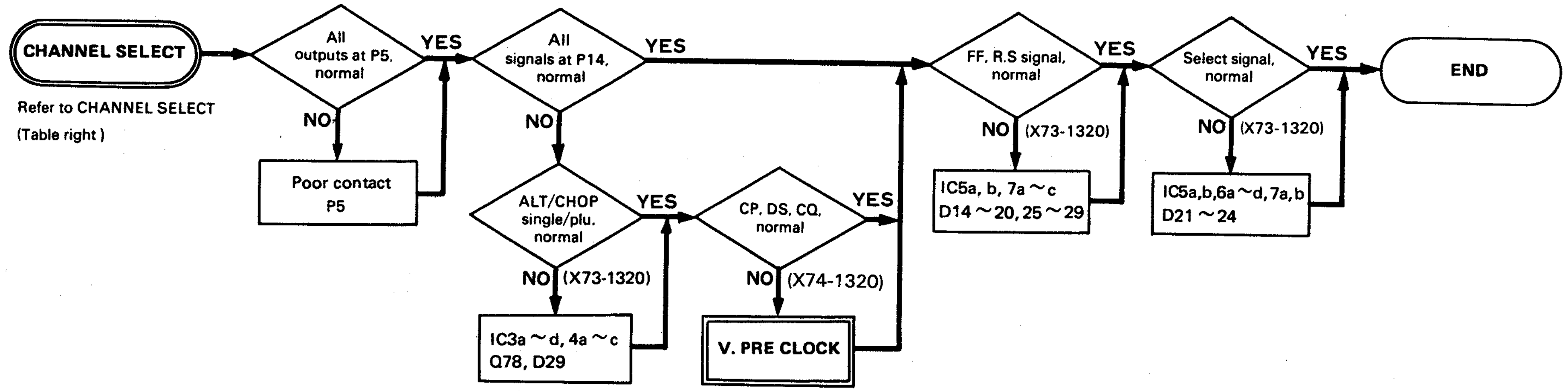

YES
Except 10ms, 0.1ms, 1μs "0.2μs ~ 0.5s" range sweep normal
NO
D6 (X74-1310)
YES
Except 20ms, 10ms, 0.2ms, 0.1,ms 2μs, 1μs, "0.5s ~ 0.5μs" range sweep normal
NO
D5 (X74-1310)
YES
"0.5s ~ 0.1s, 5ms ~ 1ms 50μs ~ 10μs" range sweep normal
NO
D4 (X74-1310)
YES
"0.5s, 0.2s 5ms, 2ms, 50μs, 20μs" range sweep normal
NO
D3 (X74-1310)
YES
"0.5s 5ms, 50μs" range sweep normal
NO
D2 (X74-1310)
YES
"0.5s ~ 10ms" sweep, normal
NO
Q12, 13, 14
YES
"5ms ~ 0.1ms" sweep, normal
NO
Q11, 15, 16
YES
"50μs ~ 1μs" sweep, normal
NO
Q10,17, 18
YES
END


YE
Except 10ms, 0.1ms, 1μs, "50ms ~ 0.2μs" range sweep normal
NO
D14 (X74-1310)
YES
Except 20ms, 10ms, 0.2ms, 0.1ms 2μs, 1μs "50ms ~ 0.5μs" range sweep, normal
NO
D13 (X74-1310)
YES
"5ms ~ 1ms, 50μs ~ 10μs" range sweep normal
NO
D12 (X74-1310)
YES
"5ms, 2ms 50μs, 20μs" range sweep, normal
NO
D11 (X74-1310)
YES
"5ms, 50μs" range sweep, normal
NO
D10 (X74-1310)
YES
"50ms ~ 10ms" range sweep, normal
NO
Q41,43
YES
"5ms ~ 0.1ms" range sweep, normal
NO
Q40,45
YES
"50μs ~ 1μs" range sweep, normal
NO
Q39,47
YES
END

TROUBLESHOOTING


CH1
(X73-1320)
Waveforms at connector P3, pin 1 and pin 2 normal
Check the VARIABLE operation
YES
NO
(X75-1120): IC12, Q1,
(X73-1320): IC1
Q6, 7 collector waveforms, normal
Check the ♦ POSITION X5, GAIN operation
YES
NO
IC1, Q1 ~ 9
All outputs of IC6, normal
Only output of IC6d is "H"
YES
NO
CHANNEL SELECT
TP waveform, normal
YES
NO
CH1: Q10 ~ 13, 18 ~ 21, 37 D1, 12
CH2: Q64 ~ 67 D2
CH3: Q23 ~ 26 D3
CH4: Q68 ~ 71 D4
Output waveform at connector P9
YES
NO
Q38, 39, 42 ~ 45
(X73-1330) output, normal
YES
NO
(X73-1330)
Q1 ~ 5, 7 ~ 11 13, 14
END


CH2
(X73-1320)
Waveform at connector P4, pin 5 and pin 6 normal
YES
NO
(X75-1120) IC13, Q2,
(X73-1320) IC2
Q54, 55 collector waveform, noamal
Check the ♦ POSITION X5 GAIN CH2 INV. operation
YES
NO
IC2 Q46, 47, 50 ~ 57 D5, 6
All output of IC6, normal
When X-Y operation, only output of IC6b: is "H".
YES
NO
CHANNEL SELECT
TP waveform normal
When X-Y operation, check the waveform of CH1 signal.
YES
NO
Q58 ~ 61, 64 ~ 67 D2
END


CHANNEL SELECT
Refer to CHANNEL SELECT (Table right)
All outputs at P5, normal
YES
NO
Poor contact P5
All signals at P14, normal
YES
NO
ALT/CHOP single/plu. normal
YES
NO
(X73-1320)
IC3a ~ d, 4a ~ c Q78, D29
CP, DS, CQ, normal
YES
NO
(X74-1320)
V. PRE CLOCK
FF, R.S signal, normal
YES
NO
(X73-1320)
IC5a, b, 7a ~ c D14 ~ 20, 25 ~ 29
Select signal, normal
YES
NO
(X73-1320)
IC5a, b, 6a ~ d, 7a, b D21 ~ 24
END

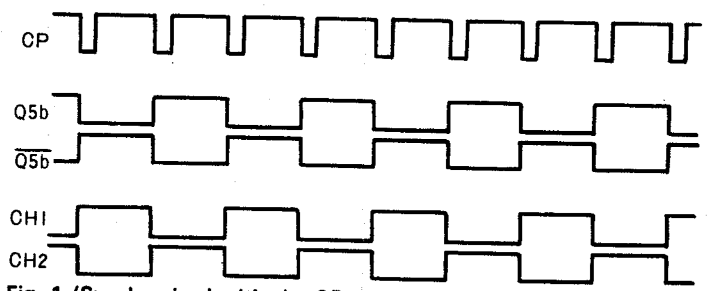

CP
Q5b
$\overline{Q5b}$
CHI
CH2

Fig. 1 (Synchronized with the CP signal regardless of the DS signal)

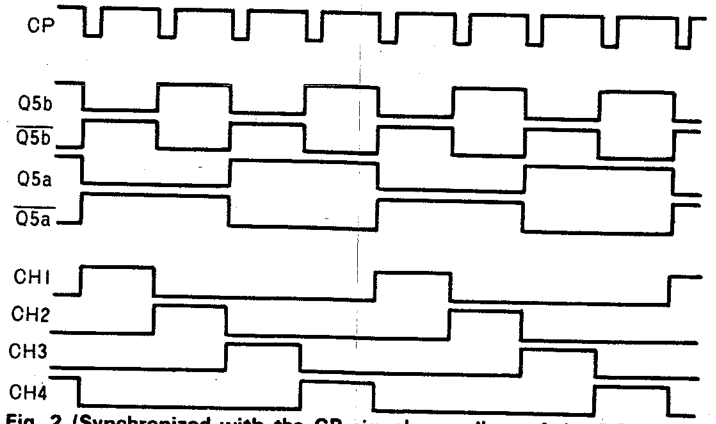
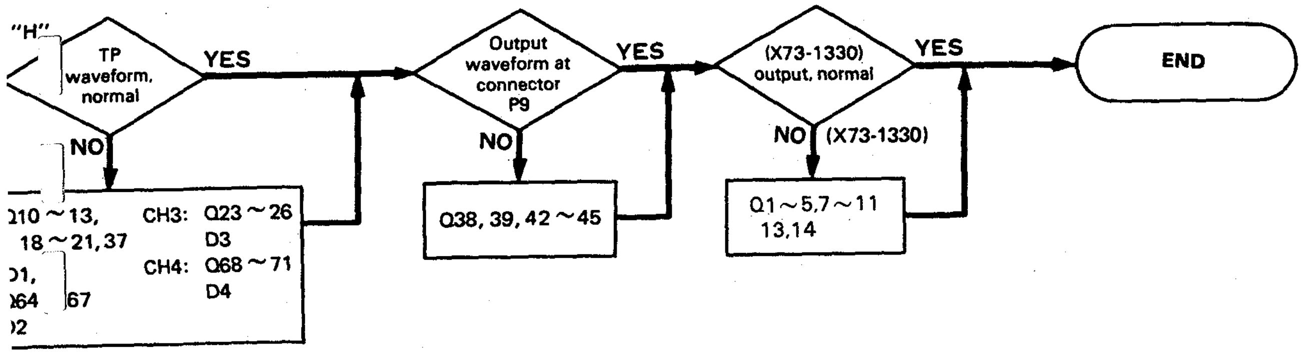
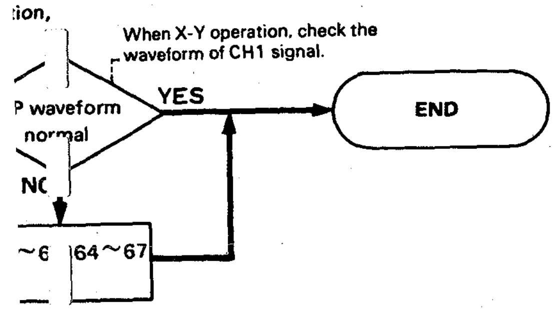
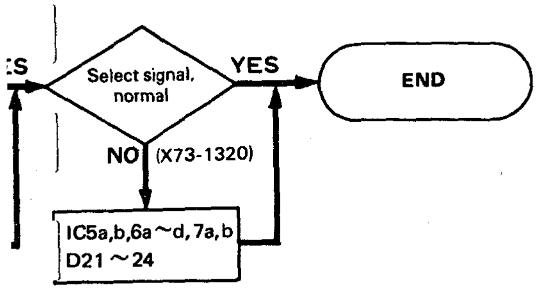

CP
Q5b
$\overline{Q5b}$
Q5a
$\overline{Q5a}$
CHI
CH2
CH3
CH4

Fig. 2 (Synchronized with the CP signal regardless of the DS signal)

TROUBLESHOOTING


"H"
TP waveform, normal
YES
NO
10 ~ 13,
18 ~ 21, 37
1,
64
67
2
CH3: Q23 ~ 26
D3
CH4: Q68 ~ 71
D4
Output waveform at connector P9
YES
NO
Q38, 39, 42 ~ 45
(X73-1330) output, normal
YES
NO (X73-1330)
Q1 ~ 5, 7 ~ 11
13, 14
END


ion,
When X-Y operation, check the waveform of CH1 signal.
P waveform normal
YES
NC
END
~6
64 ~ 67


S
Select signal, normal
YES
END
NO (X73-1320)
IC5a,b,6a ~ d,7a,b
D21 ~ 24

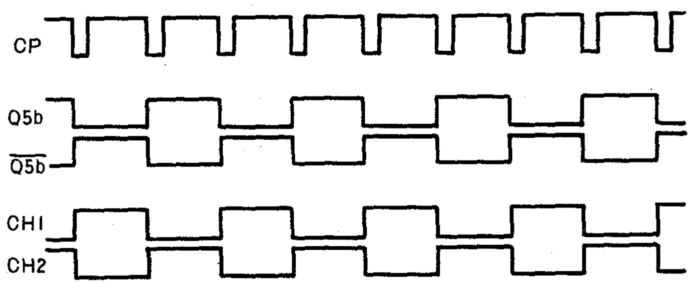

CP
Q5b
$\overline{Q5b}$
CH1
CH2

Fig. 1 (Synchronized with the CP signal regardless of the DS signal)

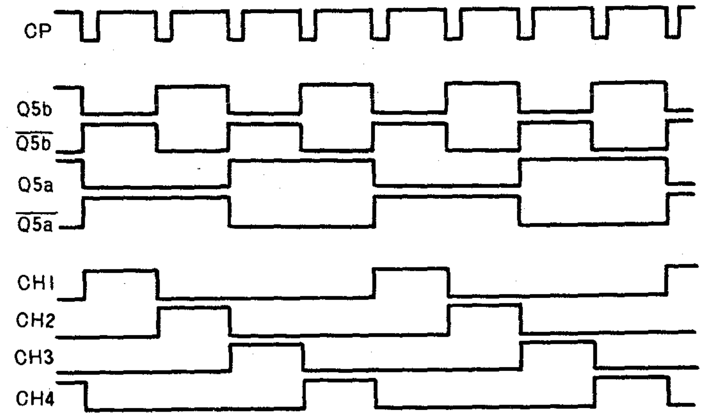
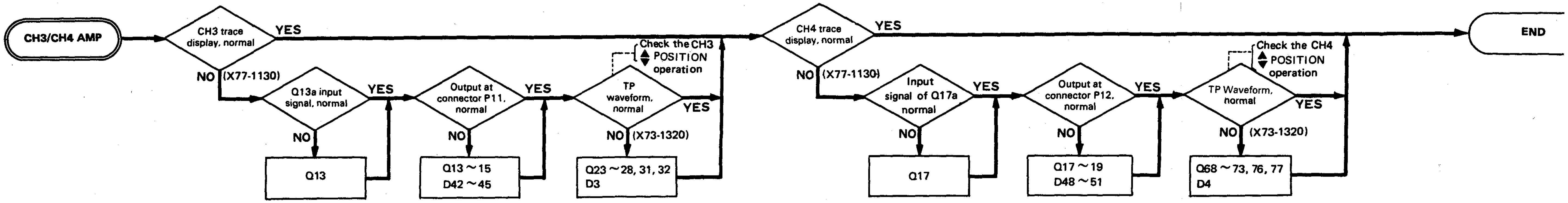

CP
Q5b
$\overline{Q5b}$
Q5a
$\overline{Q5a}$
CH1
CH2
CH3
CH4

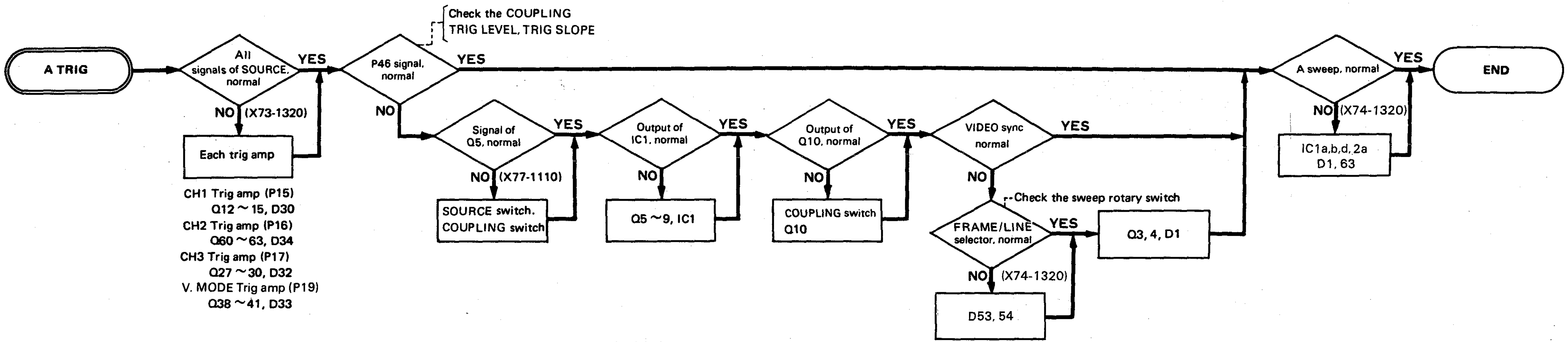
Fig. 2 (Synchronized with the CP signal regardless of the DS signal)

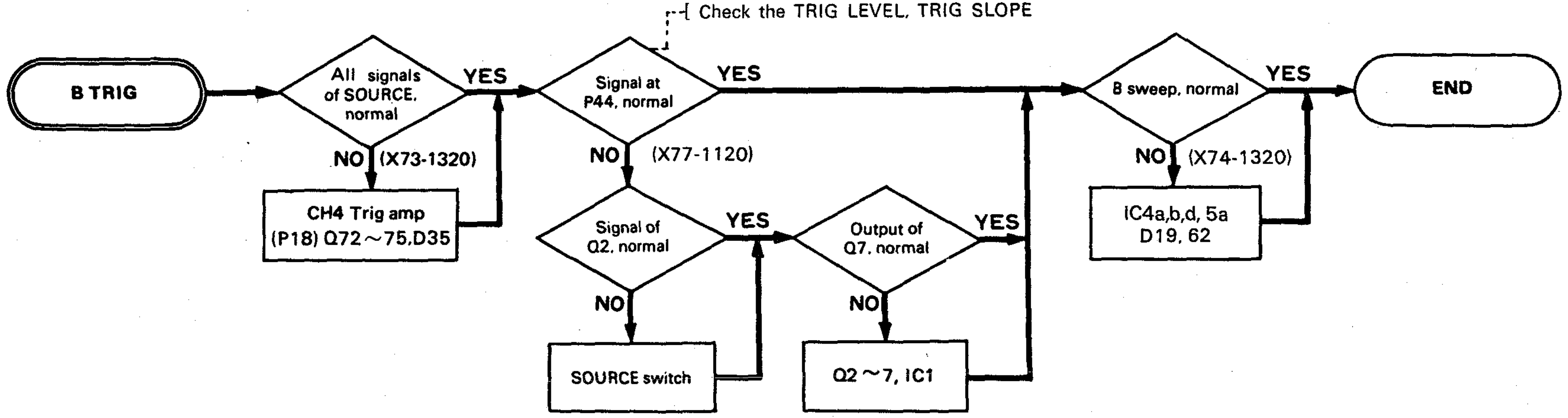
CHANNEL SELECT

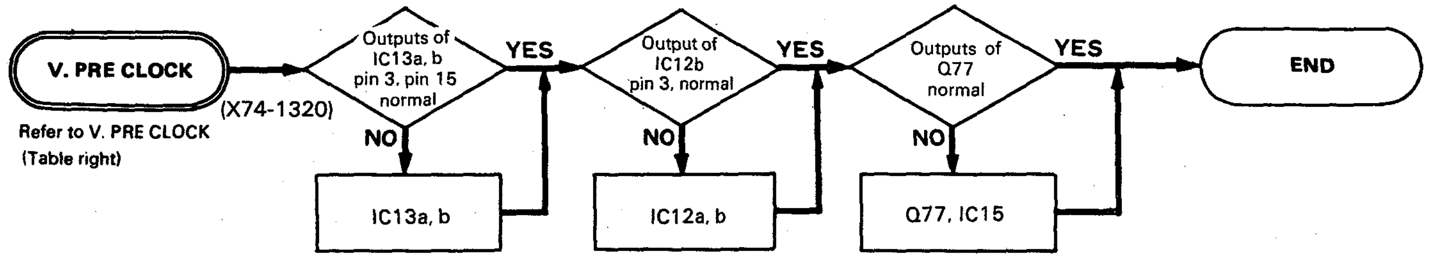
				MODE INPUT LOG OUTPUT(P5) signal					VERTICAL CLOCK (P14)					FLIP-FLOP PRESET, CLEAR signal			FLIP-FLOP OUTPUT signal				CHANNEL SELECT signal			
				CH1	CH2	DUAL	ADD	ALT	ALT/CHOP	Single/plu	CP	DS	CQ	R5b	S5b	R5a	Q5b	$\overline{Q5b}$	Q5a	$\overline{Q5a}$	CH1	CH2	CH3	CH4
SWEEP OPERATION	Except the DUAL SWEEP	CH1		L	H	H	H	H	L	L	L	L	X	L	H	L	L	H	L	H	H	L	L	L
		CH2		H	L	H	H	H	L	L	L	L	X	H	L	L	H	L	L	H	L	H	L	L
		ADD		H	H	H	L	H	L	L	L	L	X	L	L	L	H	H	L	H	H	H	L	L
		DUAL	ALT	H	H	L	H	L	L	H	⎍⎍	⎍⎍	L	H	H	L	TOGGLE		L	H	Fig1		L	L
			CHOP					H	H															
		QUAD	ALT			H		L	L							H	TOGGLE		TOGGLE		Fig2			
			CHOP					H	H															
X-Y operation				X	X	X	X	X	X	H	H	L	L	L	H	L	L	H	L	H	H	L	L	L

(Note) "X" H or L


CH3/CH4 AMP
CH3 trace display, normal
YES
NO
(X77-1130)
Q13a input signal, normal
YES
NO
Q13
Output at connector P11, normal
YES
NO
Q13 ~ 15
D42 ~ 45
Check the CH3 ⇕ POSITION operation
TP waveform, normal
YES
NO
(X73-1320)
Q23 ~ 28, 31, 32
D3
CH4 trace display, normal
YES
NO
(X77-1130)
Input signal of Q17a normal
YES
NO
Q17
Output at connector P12, normal
YES
NO
Q17 ~ 19
D48 ~ 51
Check the CH4 ⇕ POSITION operation
TP Waveform, normal
YES
NO
(X73-1320)
Q68 ~ 73, 76, 77
D4
END


Check the COUPLING
TRIG LEVEL, TRIG SLOPE
A TRIG
All signals of SOURCE, normal
YES
NO
(X73-1320)
Each trig amp
CH1 Trig amp (P15)
Q12 ~ 15, D30
CH2 Trig amp (P16)
Q60 ~ 63, D34
CH3 Trig amp (P17)
Q27 ~ 30, D32
V. MODE Trig amp (P19)
Q38 ~ 41, D33
P46 signal, normal
YES
NO
Signal of Q5, normal
YES
NO
(X77-1110)
SOURCE switch,
COUPLING switch
Output of IC1, normal
YES
NO
Q5 ~ 9, IC1
Output of Q10, normal
YES
NO
COUPLING switch
Q10
VIDEO sync normal
YES
NO
Check the sweep rotary switch
FRAME/LINE selector, normal
YES
NO
(X74-1320)
Q3, 4, D1
D53, 54
A sweep, normal
YES
NO
(X74-1320)
IC1a,b,d, 2a
D1, 63
END


Check the TRIG LEVEL, TRIG SLOPE
B TRIG
All signals of SOURCE, normal
YES
NO
(X73-1320)
CH4 Trig amp
(P18) Q72 ~ 75, D35
Signal at P44, normal
YES
NO
(X77-1120)
Signal of Q2, normal
YES
NO
SOURCE switch
Output of Q7, normal
YES
NO
Q2 ~ 7, IC1
B sweep, normal
YES
NO
(X74-1320)
IC4a,b,d, 5a
D19, 62
END


V. PRE CLOCK
(X74-1320)
Refer to V. PRE CLOCK
(Table right)
Outputs of IC13a, b pin 3, pin 15 normal
YES
NO
IC13a, b
Output of IC12b pin 3, normal
YES
NO
IC12a, b
Outputs of Q77 normal
YES
NO
Q77, IC15
END

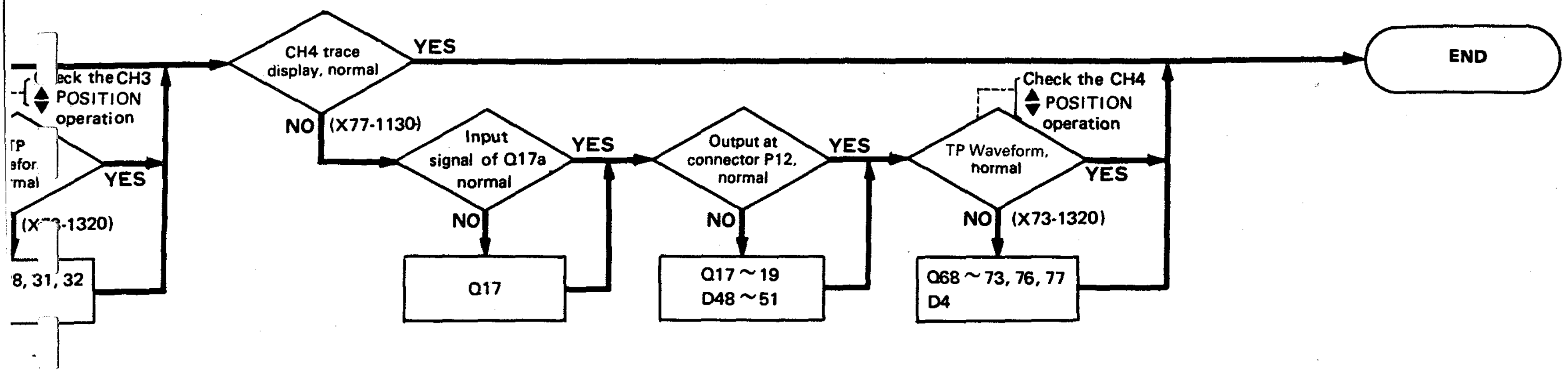
V. PRE CLOCK

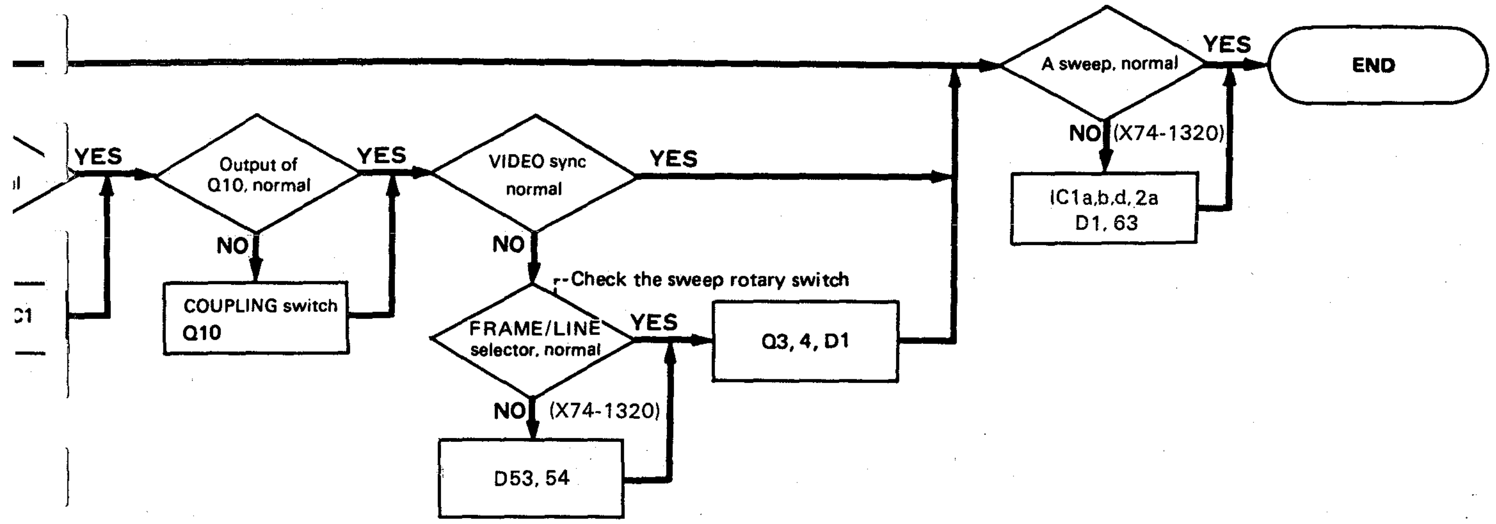
		INPUT		OUTPUT				
MODE		ALT / CHOP	Single / PLU	IC14d	IC15a,b	IC15c,d	CP	DS*4
SWEEP Operation	CH1	L	L	H	Refer to the right table.	QA*1	$\overline{QA}$*2	H
	CH2	L	L	H		QA*1	$\overline{QA}$*2	H
DUAL	ALT	L	H	H		QA*1	$\overline{QA}$*2	H
	CHOP	H		L		CHOP Osc.	CHOP Pulse	H
	ADD	L	L	H		QA*1	$\overline{QA}$*2	H
QUAD	ALT	L	H	H		QA*1	$\overline{QA}$*2	H
	CHOP	H		L		CHOP Osc.	CHOP Pulse	H
X-Y Operation		DUAL, ALT :L QUAD, ALT :L OTHER :H	H	DUAL, ALT :H QUAD, ALT :H OTHER :L		CHOP Osc. *3	CHOP Pulse *3	H

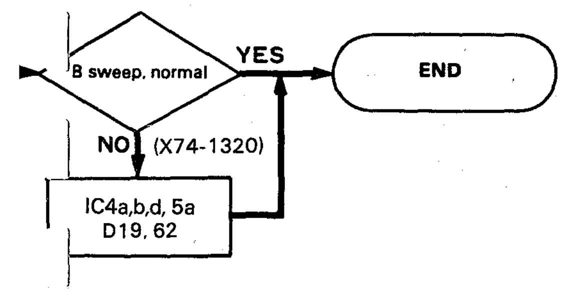
Each signal of IC16a, CP, DS vary by H. DISPLAY.

H. DISPLA
A
ALT
A-INT-I
B DLY'I
X-Y

TROUBLESHOOTING


eck the CH3
POSITION
operation
TP
efor
rmal
YES
(X7-1320)
8, 31, 32
CH4 trace display, normal
YES
NO
(X77-1130)
Input signal of Q17a normal
YES
NO
Q17
Output at connector P12, normal
YES
NO
Q17 ~ 19
D48 ~ 51
Check the CH4
POSITION
operation
TP Waveform, normal
YES
NO
(X73-1320)
Q68 ~ 73, 76, 77
D4
END


A sweep, normal
YES
END
NO
(X74-1320)
IC1a,b,d, 2a
D1, 63
YES
Output of Q10, normal
YES
NO
COUPLING switch
Q10
VIDEO sync normal
YES
NO
Check the sweep rotary switch
FRAME/LINE selector, normal
YES
Q3, 4, D1
NO
(X74-1320)
D53, 54
C1


B sweep, normal
YES
END
NO
(X74-1320)
IC4a,b,d, 5a
D19, 62

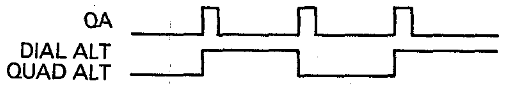
V. PRE CLOCK

			INPUT		OUTPUT				
	MODE		ALT / CHOP	Single / PLU	IC14d	IC15a,b	IC15c,d	CP	DS*4
SWEEP Operation	CH1		L	L	H	Refer to the right table.	QA*1	$\overline{QA}$*2	H
	CH2		L	L	H		QA*1	$\overline{QA}$*2	H
	DUAL	ALT	L	H	H		QA*1	$\overline{QA}$*2	H
		CHOP	H		L		CHOP Osc.	CHOP Pulse	H
	ADD		L	L	H		QA*1	$\overline{QA}$*2	H
	QUAD	ALT	L	H	H		QA*1	$\overline{QA}$*2	H
		CHOP	H		L		CHOP Osc.	CHOP Pulse	H
X-Y Operation			DUAL, ALT } : L QUAD, ALT } : L OTHER : H	H	DUAL, ALT } : H QUAD, ALT } : H OTHER : L		CHOP Osc. *3	CHOP Pulse *3	H

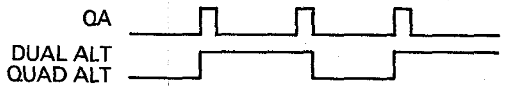
Each signal of IC16a, CP, DS vary by H. DISPLAY.

H. DISPLAY	IC15b Pin 7	IC15b Pin 6	IC15a, b OUTPUT	CQ	IC13a Q
A	L	L	QA	L	H
ALT	H	L	L	L	*5
A-INT-B	L	L	QA	L	H
B DLY'D	L	L	QA	L	L
X-Y	H	L	L	L	H

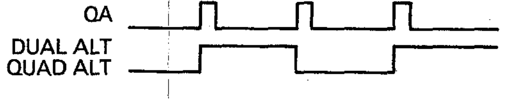
*1. H. DISPLAY: ALT
CH1, CH2 ADD: L


QA
DIAL ALT
QUAD ALT

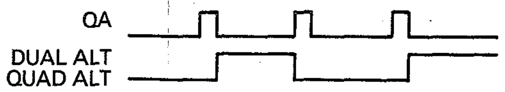
H. DISPLAY: DUAL
CH1, CH2 ADD: QA


QA
DUAL ALT
QUAD ALT

*2. H. DISPLAY: ALT
CH1, CH2 ADD: H

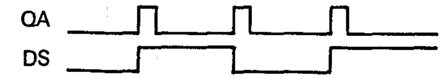

QA
DUAL ALT
QUAD ALT

H. DISPLAY: DUAL
CH1 CH2 ADD: QA

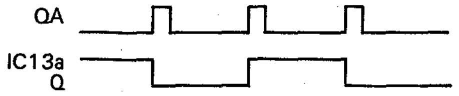

QA
DUAL ALT
QUAD ALT

*3. MODE: DUAL ALT, QUAD ALT: L

*4. H. DISPLAY: DUAL



*5. Waveform



PARTS LIST

Unless otherwise specified, all resistors are ± 5%, 1/6W and all capacitor's voltage ratings are 50WV.

The specifications and parts list and schematic diagram may be changed without notice owing to a technical innovation.

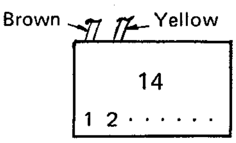
ABBREVIATIONS

Resistor	
RD	Carbon
RN	Metal film
RS	Metal film
RC	Solid
MG	Metal glaze
VR	Variable or semi-fixed
Capacitor	
CC	Ceramic
CK	Ceramic
CE	Electrolytic
CM	Mica
CQ	Mylar (Polypropylen)
TC	Ceramic trimmer
MF	Metal film
SCC	Semiconductor ceramic
Semiconductor	
TR	Transistor
FET	Field effect transistor

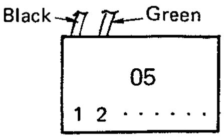
The part No. of each connector is stamped or color-coded. The color-coding is as follows.

Black	Brown	Red	Orange	Yellow	Green	Blue	Purple	Grey	White
0	1	2	3	4	5	6	7	8	9

[Example]



Connector



Connector

Each connector can be classified by the color of pin 1 and pin 2.

PARTS LIST

MAIN CHASSIS

Fig. & Index No.	Ref. No.	Parts No.	Name & Description	Serial No. Eff.	
1-1		A13-0731-42	Frame		
1-2		A13-0732-12	Frame		
1-3		A20-2756-15	Die-casting panel		
1-4		A21-1006-04	Decorative panel		
1-5		A21-1007-04	Decorative panel		
1-6		A21-0884-04	Decorative panel		
1-7		A22-0817-33	Sub panel		
1-8		A23-1627-12	Rear panel		
1-9		A33-0501-14	Reflector		
1-10		D23-0801-04	Spacer		
1-11		F15-0720-04	Blind cover		
1-12		B19-0723-03	Filter		
1-13		B20-0921-04	Floating core		
1-14		B30-0903-15	LED		
1-15		E18-0351-05	Power connector		
1-16		E04-0251-05	BNC jack		
1-17		E21-0654-04	CAL terminal		
1-18		F10-1553-14	Shield plate for CH3		
1-19		E21-0657-04	GND terminal		
1-20		E29-0504-05	Teflon terminal		
1-21		F10-1557-04	Eearth band		
1-22		E23-0513-05	Earth lug		
1-23		E23-0520-05	Earth lug		
1-24		F05-1224-05	Fuse 1.2A		
1-25		F15-0138-04	Felt		
1-26		F15-0716-14	Spacer		
1-27		E23-0522-14	Earth plate		
1-28		J13-0038-05	Fuse holder		
1-29		J19-1624-04	Stopper		
1-30		J21-2927-04	Ring-antirun		
1-31		J21-2871-14	Bracket (For D.L.)		
1-32		J29-0505-04	Retainer clamp		
1-33		J39-0506-04	Spacer		
1-34		J42-0512-04	Mounting rubber (For CRT)		
1-35		J42-0513-04	Mounting rubber (For CRT)		
1-36		J42-0514-04	Mounting rubber (For lamp)		
1-37		J61-0511-05	Wire suddle		
1-38		K21-0819-03	Knob		
1-39		K21-0821-14	Knob		
1-40		K21-0831-24	Knob		
1-41		K21-0832-14	Knob		
1-42		K21-0833-14	Knob		
1-43		K21-0837-24	Knob		
1-44		K21-0838-03	Knob		
1-45		K27-0526-04	Lever knob		
1-46		L76-0104-05	Delay line		
1-47	S29	S31-2004-05	Slide switch		
1-48			Power thermister 4W-25V		
1-49	VR1	R01-1507-05	Variable resistor 3 kΩB		
	VR2	R01-1507-05	Variable resistor 3 kΩB		
1-50	VR4a	R06-2502-05	Variable resistor 5 kΩB		
	VR4b	R06-2502-05	Variable resistor 5 kΩB		
1-51	VR3a	R23-2501-05	Variable resistor 5 kΩB		
	VR3b	R23-2501-05	Variable resistor 5 kΩB		
1-52	VR5	R29-0504-05	Potentio meter 1 kΩB		
1-53		002-0006-05	Shield gasket		
1-54		N08-0609-04	Post (Hex)		
1-55		N10-2030-41	Nut (Hex) M3		
1-56		N10-2060-46	Nut (Hex) M6		
1-57		N14-0602-34	Nut		
1-58		N14-0609-04	Nut		
1-59					
1-60		N16-0030-46	Lockwasher (For M3)		
1-61		N17-1030-41	Lockwasher (For M3)		
1-62					
1-63		N19-0702-04	Flat washer		

PARTS LIST

Fig. & Index No.	Ref. No.	Parts No.	Name & Description	Serial No. Eff.	
1-64		N19-0704-04	Flat washer		
1-65					
1-66		N30-3006-46	Pan-head screw M3 × 6		
1-67		N30-3008-41	Pan-head screw M3 × 8		
1-68		N32-2606-46	Flat-head screw M2.6 × 6		
1-69		N32-3006-46	Flat-head screw M3 × 6		
1-70		N89-3006-46	Screw (Tapping) 3 × 6		
1-71		N89-3008-46	Screw (Tapping) 3 × 8		
1-72		N89-3010-46	Screw (Tapping) 3 × 10		
1-73		N09-0707-05	Flat-head screw (Tapping) (3 × 18)		
1-74		W02-0407-05	High voltage block		
1-75		W02-0405-15	Switching power block		
1-76		X68-1310-01	Power blanking unit		
1-77		R03-3502-15	Variable resistor 10 kΩB		
1-78		R05-8001-05	Variable resistor 3 MΩB		
1-79		R23-1501-05	Variable resistor 1 kΩB		
1-80		F02-0503-04	Heat sink		
1-81		J21-2930-04	Bracket (For VR)		
1-82		N09-0078-05	Screw M3 × 6 (Plastic)		
1-83		X73-1320-01	Vertical pre amp unit		
1-84		X73-1330-01	Vertical output unit		
1-85		F02-0501-04	Heat sink		
1-86		X74-1320-01	Trig sweep unit		
1-87		X74-1230-01	Horizontal output amp unit		
1-88		F01-0827-04	Heat sink		
1-89		X74-1310-01	Sweep rotary unit		
1-90		S02-2504-15	Rotaly switch		
1-91		X75-1120-01	Vertical ATT unit		
1-92		X77-1110-01	A trig switch unit		
1-93		S33-2501-05	Lever switch		
1-94		S32-4008-05	Lever switch		
1-95		R01-2516-05	Variable resistor 5 kΩB		
1-96		X77-1120-01	B trig switch unit		
1-97		S37-2005-05	Lever switch		
1-98		R01-2515-05	Variable resistor 5 kΩB		
1-99		X77-1130-01	Horizontal mode control unit		
1-100		J25-2900-03	Printed circuit board		
1-101		K27-0524-14	Push knob		
1-102	S10	S40-1504-05	Tact switch		
	S11	S40-1504-05	Tact switch		
	S12	S40-1504-05	Tact switch		
	S13	S40-1504-05	Tact switch		
	S15	S40-1504-05	Tact switch		
	S16	S40-1504-05	Tact switch		
	S17	S40-1504-05	Tact switch		
	S18	S40-1504-05	Tact switch		
	S19	S40-1504-05	Tact switch		
1-103		J25-2902-03	Printed circuit board		
1-104		G01-0906-14	Spring		
1-105		J39-0509-04	Supporter for P.C.B.		
1-106			LED K-14LN322GP		
1-107		F11-0963-03	Shield case		

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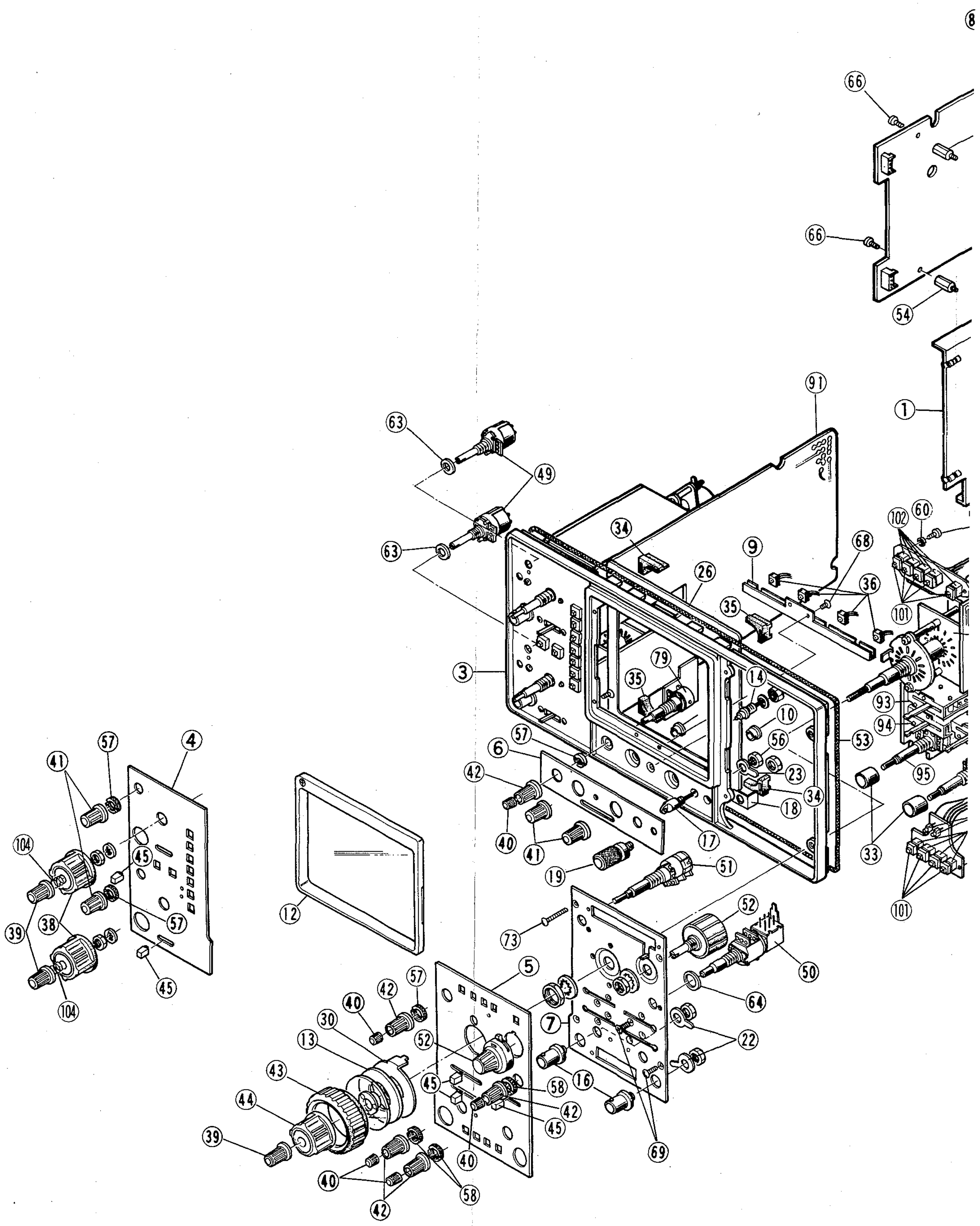

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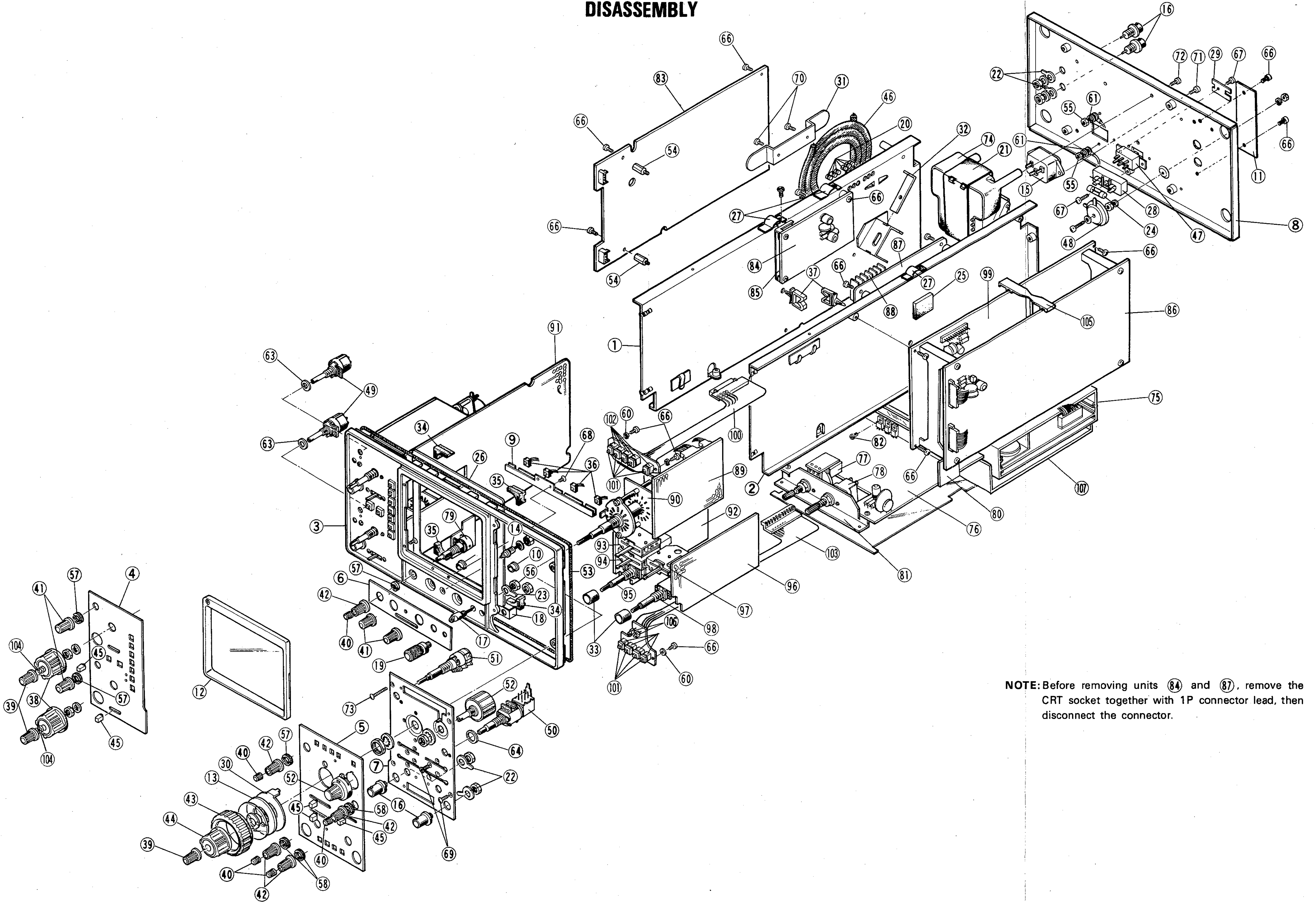
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NOTE: Before removing units (84) and (87), remove the CRT socket together with 1P connector lead, then disconnect the connector.

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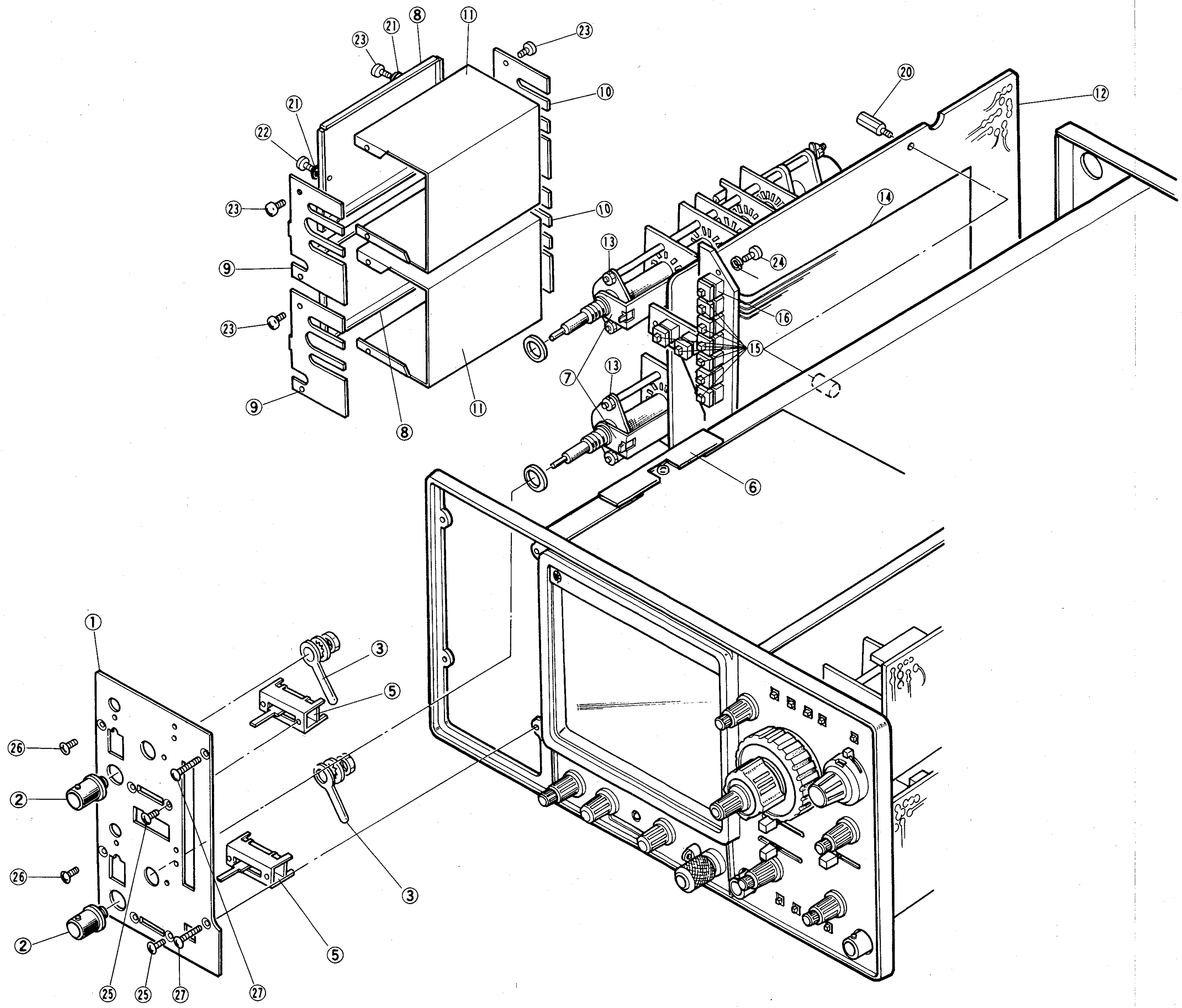

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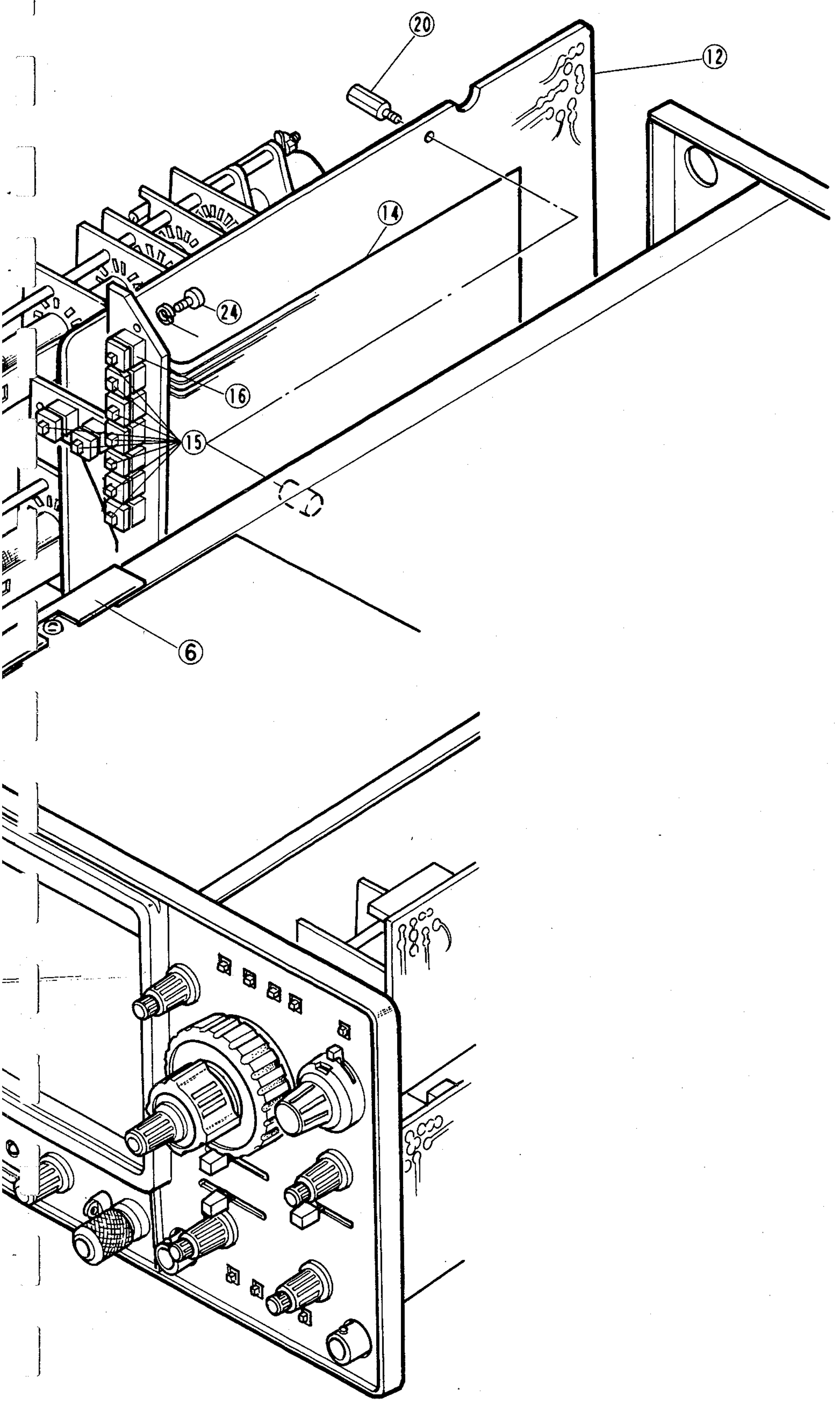

PARTS LIST

Fig. & Index No.	Ref. No.	Parts No.	Name & Description	Serial No. Eff.	
2-1		A22-0823-03	Sub panel		
2-2		E04-0251-05	BNC jack		
2-3		E23-0519-04	Earth lug		
2-4		No use			
2-5	S25	S31-2506-05	Slide switch		
	S26	S31-2506-05	Slide switch		
2-6		G13-0714-04	Cushion		
2-7		E23-0521-04	Earth terminal		
2-8		F11-0961-04	Shield case		
2-9		F11-0964-04	Shield case		
2-10		F11-0965-04	Shield case		
2-11		F11-0966-04	Shield case		
2-12		X75-1120-01	Vertical ATT unit		
2-13		S01-4503-05	Rotary switch		
2-14		J25-2898-03	Printed circuit board		
2-15		K27-0524-14	Push knob		
2-16	S1	S40-1504-05	Tact switch		
	S2	S40-1504-05	Tact switch		
	S3	S40-1504-05	Tact switch		
	S4	S40-1504-05	Tact switch		
	S5	S40-1504-05	Tact switch		
	S6	S40-1504-05	Tact switch		
	S7	S40-1504-05	Tact switch		
	S8	S40-1504-05	Tact switch		
	S9	S40-1504-05	Tact switch		
2-17		No use			
2-18		No use			
2-19		No use			
2-20		N08-0609-04	Post (Hex)		
2-21		N16-0026-46	Lockwasher		
2-22		N16-0030-46	Lockwasher		
2-23		N30-2604-46	Pan-head screw M2.6 × 4		
2-24		N30-3006-46	Pan-head screw M3 × 6		
2-25		N32-2004-46	Flat-head screw M2 × 4		
2-26		N32-3006-46	Flat-head screw M3 × 6		
2-27		N09-0707-05	Flat-head screw (Tapping) 3 × 18		

PARTS LIST

Fig. & Index No.	Ref. No.	Parts No.	Name & Description	Serial No. Eff.	
3-1		E01-1403-05	CRT socket		
3-2		E31-0564-05	Leadwire with connector		
3-3		F11-0976-02	CRT shield		
3-4		F11-0975-03	CRT shield		
3-5		G13-0715-04	Cable retainer		
3-6		G16-0602-04	Reflector sheet		
3-7		G16-0603-04	Reflector sheet		
3-8		J19-1623-04	CRT band		
3-9		J21-2925-03	Bracket (For CRT)		
3-10		J21-2926-03	Bracket (For CRT)		
3-11			CRT 150CTM31		
3-12		L39-0515-05	Rotator coil		
3-13		G13-0714-04	Cushion		
3-14		N15-1030-41	Lockwasher		
3-15		N16-0030-46	Lockwasher		
3-16		N30-3035-46	Pan-head screw 3 × 35		
3-17		N30-3008-46	Pan-head screw M4 × 8		
3-18		N89-3006-46	Screw (Tapping) 3 × 6		
3-19		N89-3010-41	Screw (Tapping) 3 × 10		

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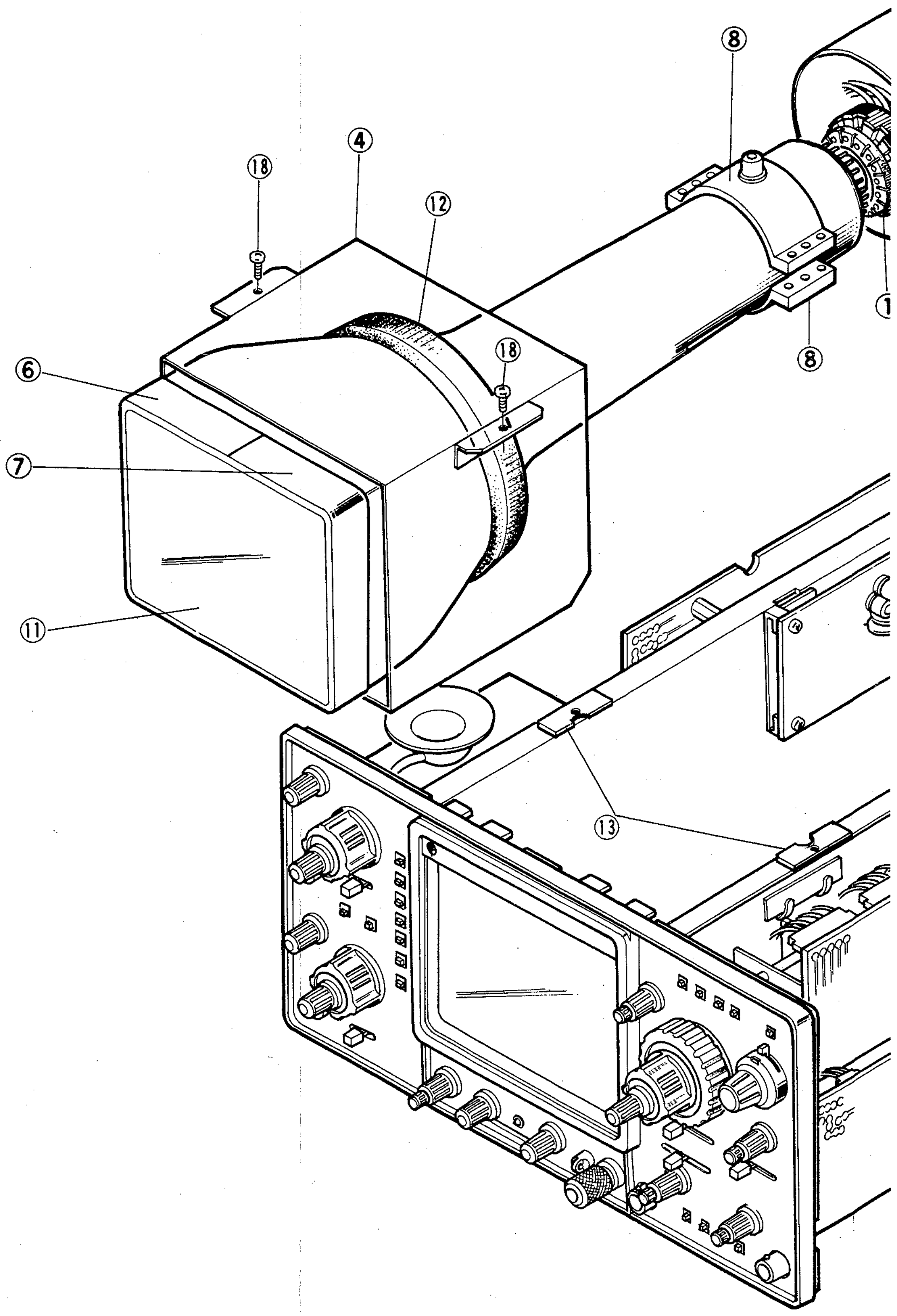

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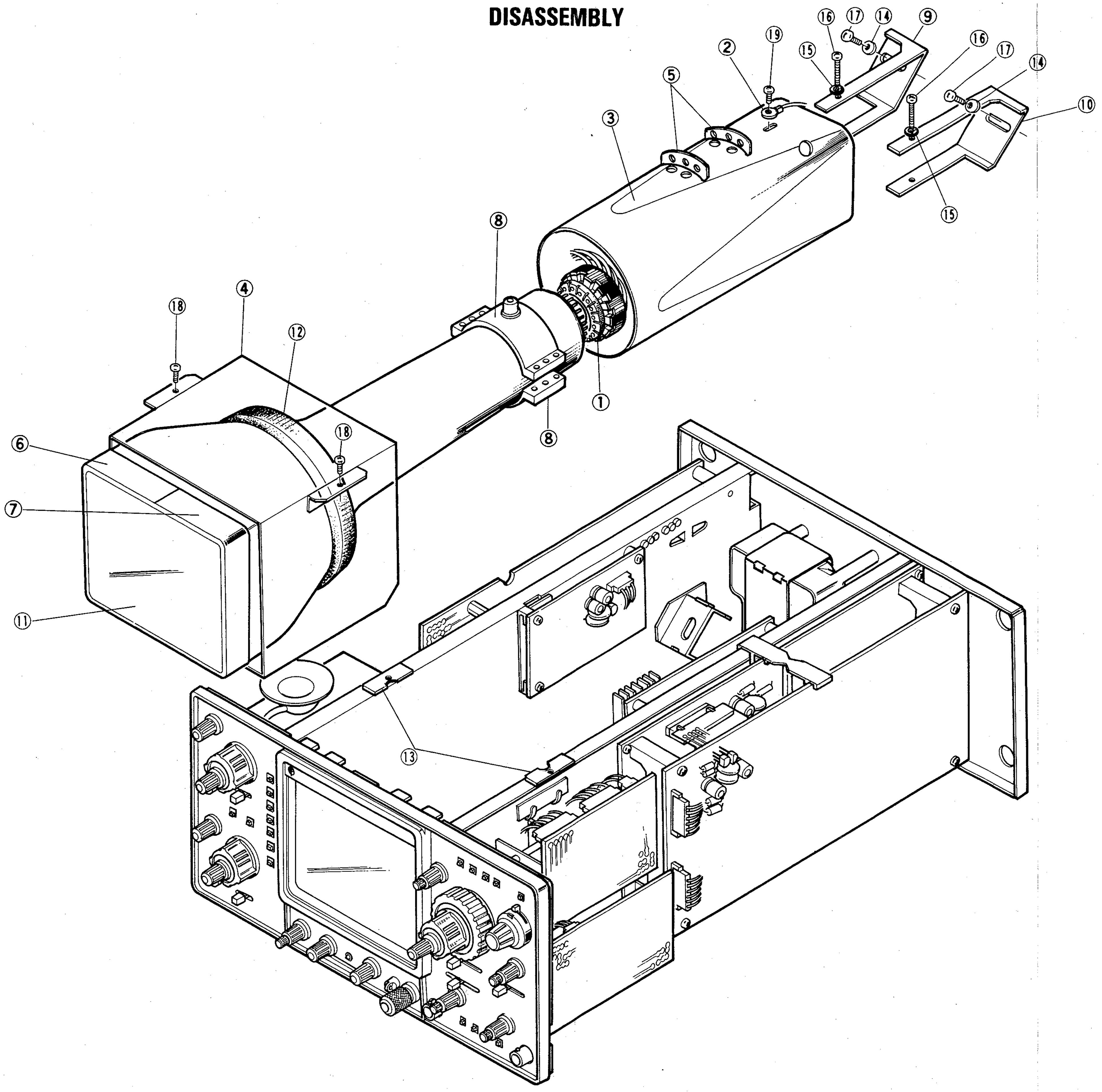
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DISASSEMBLY / PARTS LIST

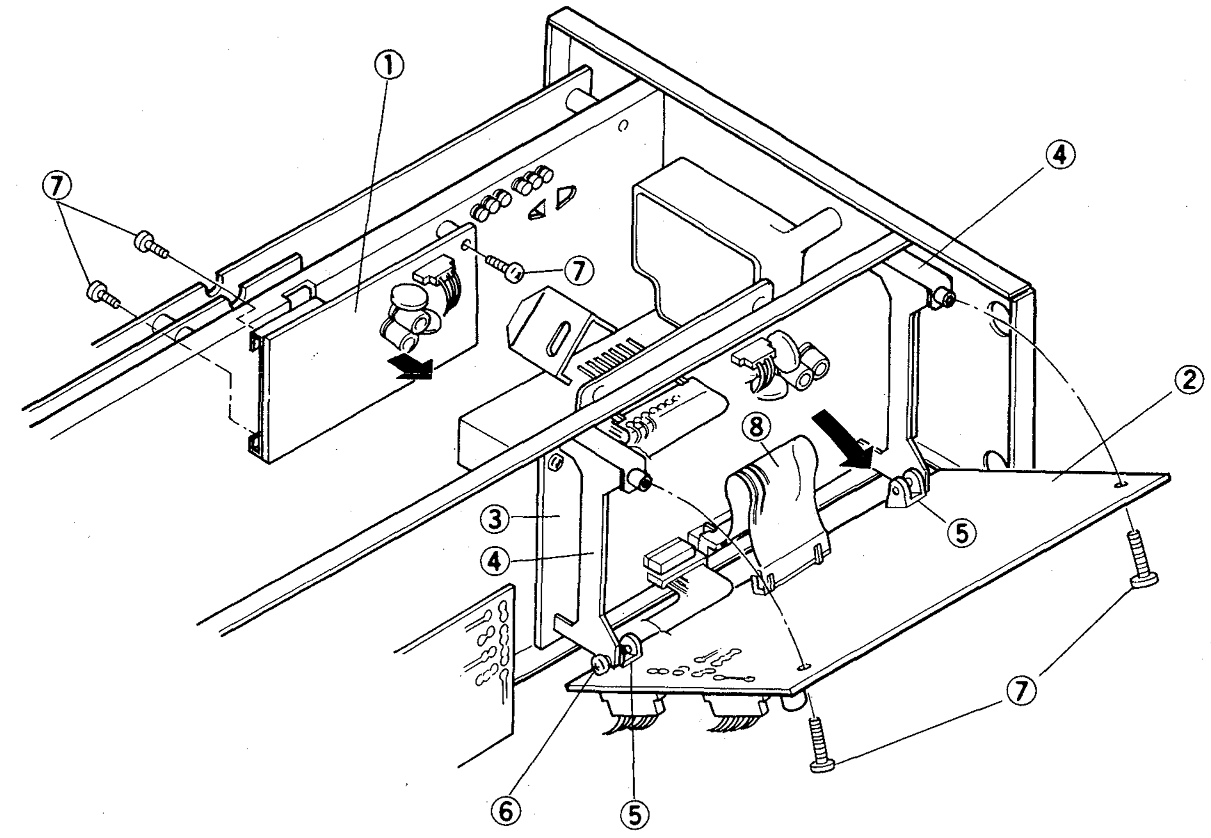

Fig. & Index No.	Ref. No.	Parts No.	Name & Description	Serial No. Eff.	
4-1		X73-1330-01	Vertical output unit		
4-2		X74-1320-01	Trig sweep unit		
4-3		X77-1130-01	Horizontal mode control unit		
4-4		J21-2904-24	Bracket (For P.C.B.)		
4-5		J21-2952-04	Bracket (For P.C.B.)		
4-6		J59-0402-05	Screw (Nylon rivet)		
4-7		N30-3006-46	Pan-head screw M3 × 6		
4-8		J25-2904-04	Printed circuit board		

DISASSEMBLY/PARTS LIST

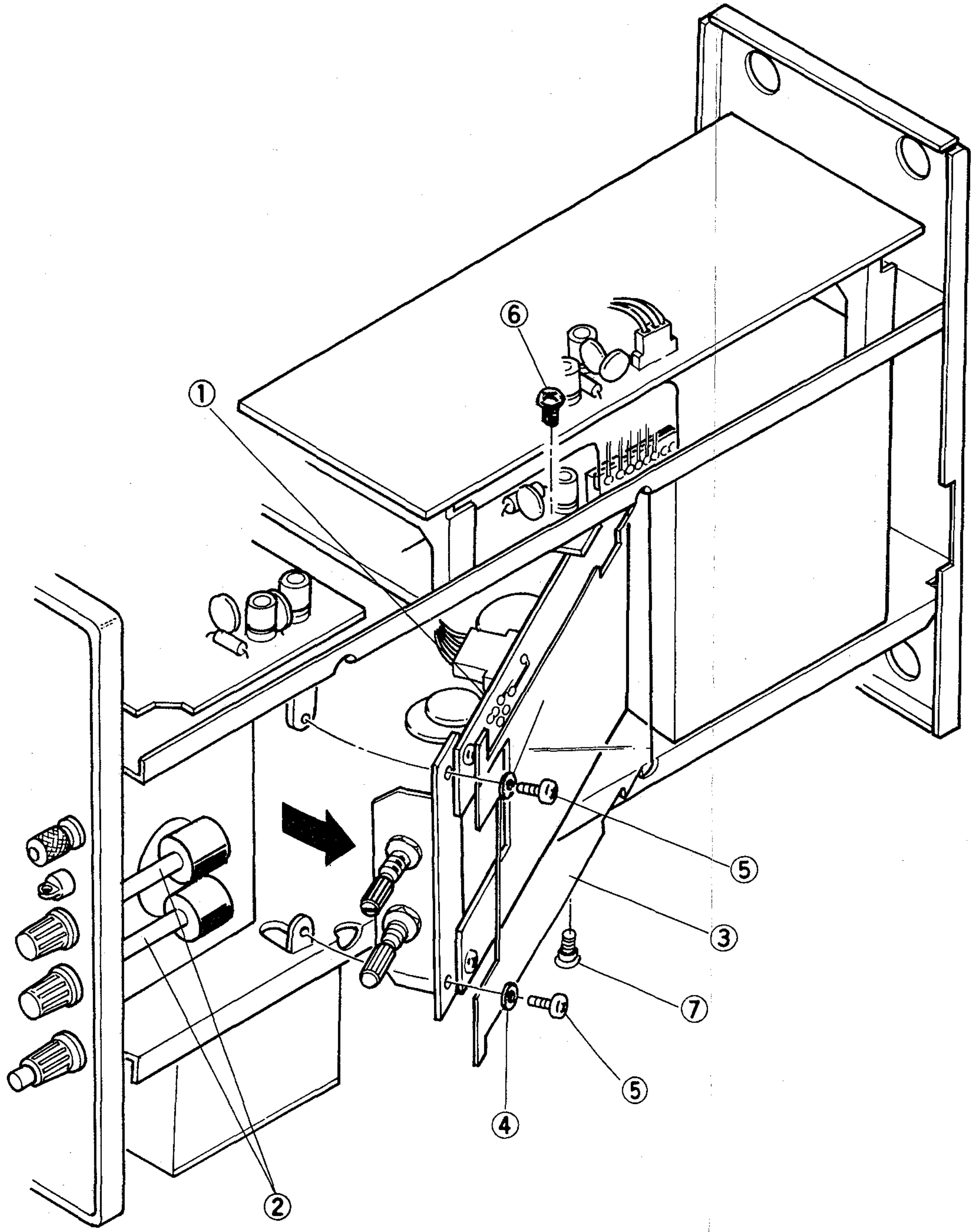

Fig. & Index No.	Ref. No.	Parts No.	Name & Description	Serial No. Eff.	
5-1		X68-1310-01	Power blanking unit		
5-2		D21-0903-14	Extension shaft		
5-3		F20-0624-04	Insulator		
5-4		N16-0030-46	Lockwasher		
5-5		N30-3006-46	Pan-head screw M3 × 8		
5-6		N89-3006-46	Screw (Tapping) 3 × 6		
5-7		N09-0402-05	Screw		

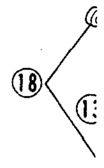

Fig. & Index No.
6-1
6-2
6-3
6-4
6-5
6-6
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6-10
6-11
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6-19

Note: When

DISASSEMBLY/PARTS LIST

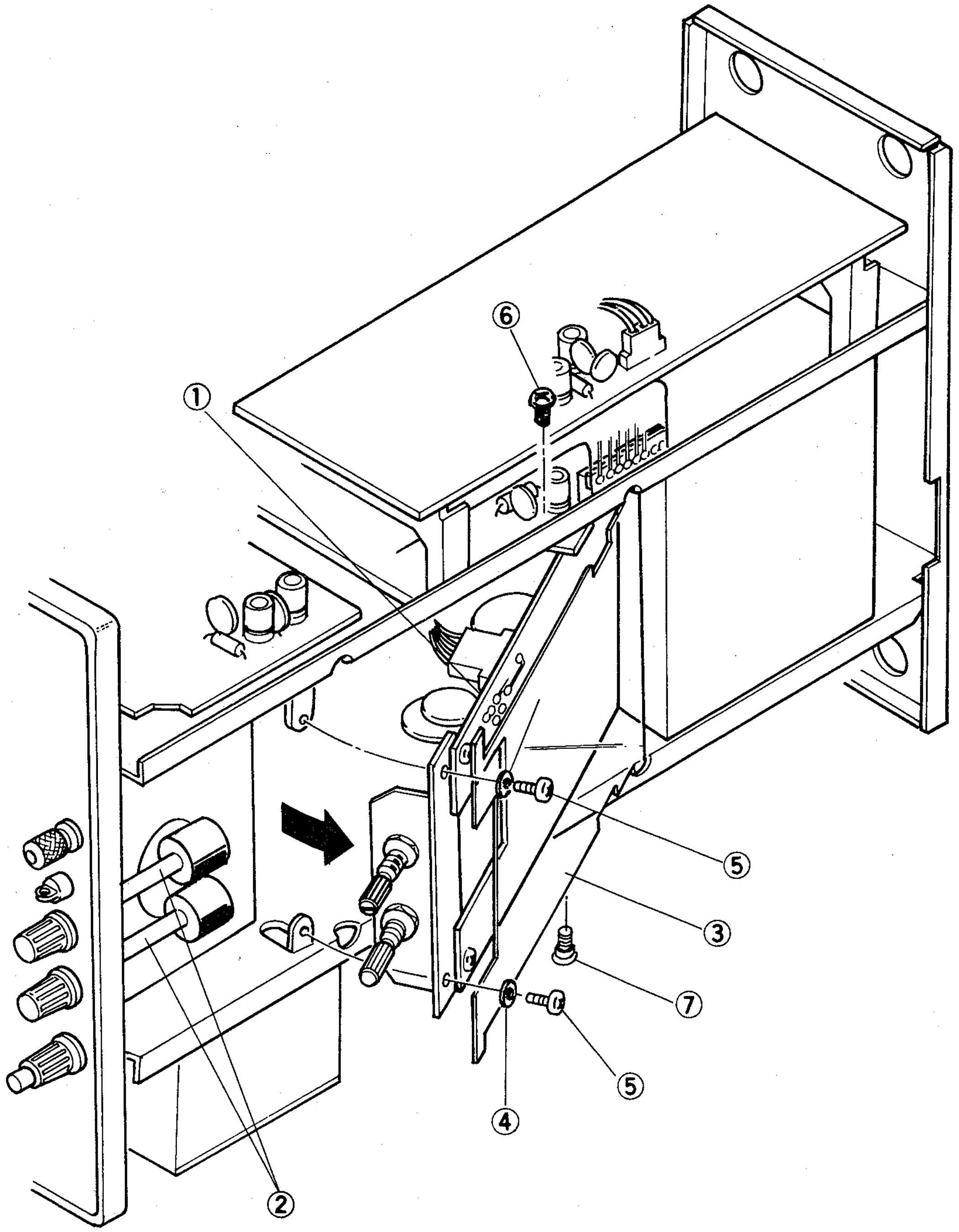

Fig. & Index No.	Ref. No.	Parts No.	Name & Description	Serial No. Eff.	
5-1		X68-1310-01	Power blanking unit		
5-2		D21-0903-14	Extension shaft		
5-3		F20-0624-04	Insulator		
5-4		N16-0030-46	Lockwasher		
5-5		N30-3006-46	Pan-head screw M3 × 8		
5-6		N89-3006-46	Screw (Tapping) 3 × 6		
5-7		N09-0402-05	Screw		

DISASSEMBLY/ PARTS LIST

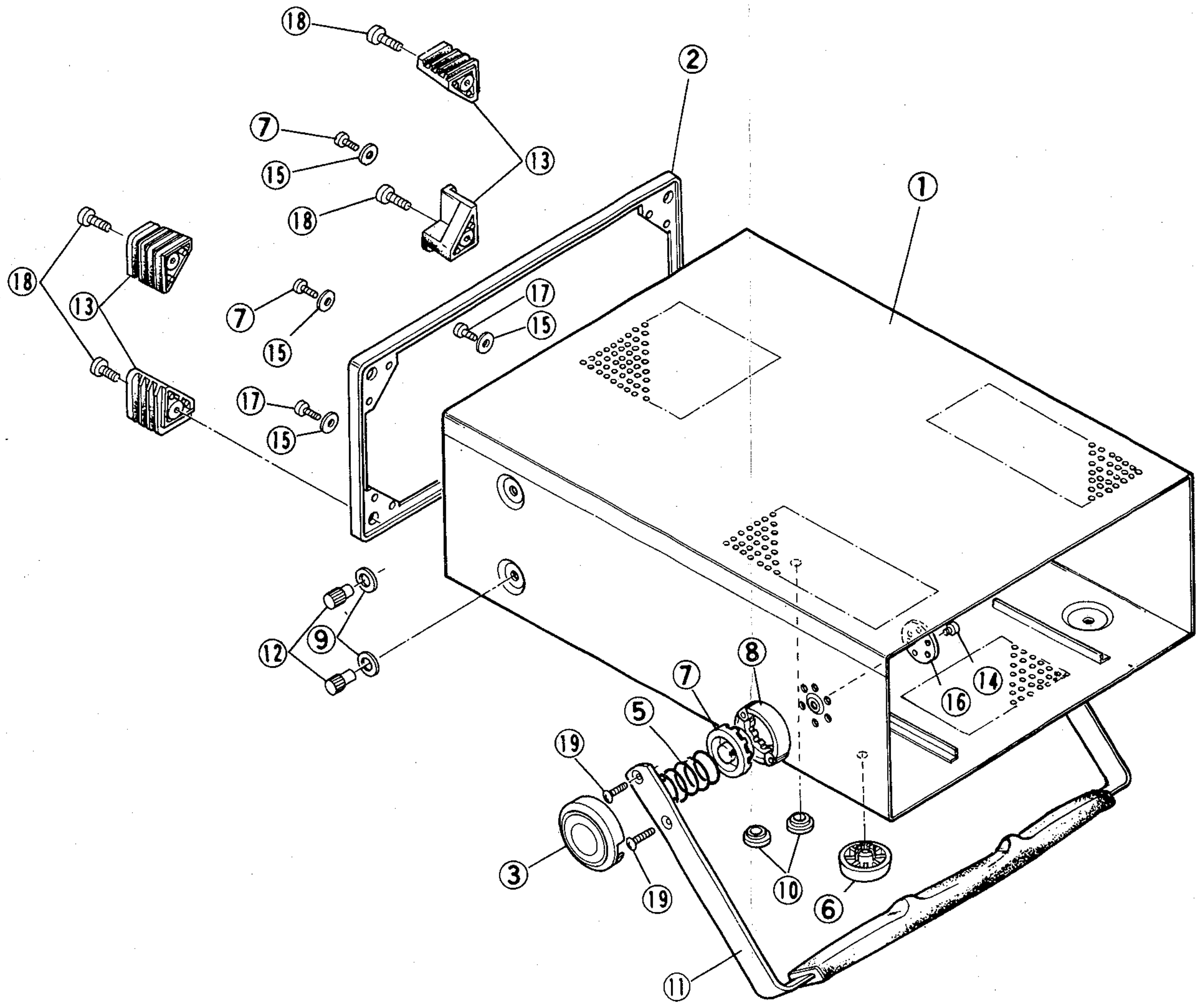

Fig. & Index No.	Ref. No.	Parts No.	Name & Description	Serial No. Eff.	
6-1		A01-0872-22	Case		
6-2		B07-0710-02	Rear escutcheon		
6-3		F07-0908-14	Handle cover		
6-4		No use			
6-5		G02-0606-14	Spring (For handle)		
6-6		J02-0507-05	Rubber leg		
6-7		J21-2906-05	Gear		
6-8		J21-2907-05	Ring		
6-9		J39-0505-04	Spacer		
6-10		J42-0038-04	Bushing		
6-11		K01-0512-05	Handle		
6-12		K23-0802-14	Knob	....	*Note:
6-13		W01-0503-04	Cord wrap		
6-14		N09-0705-05	Hex socket Flat-head screw		
6-15		N17-1030-41	Lockwasher		
6-16		N19-0710-05	Washer		
6-17		N30-3008-41	Pan-head screw M3 × 8		
6-18		N08-0611-04	Flat head screw M6 × 11		
6-19		N32-3008-41	Flat-head screw M3 × 8		

Note: When replacing R01-0512-05 with R01-0512-15, use the knob (K23-0802-14) simultaneously.

PACKING/PARTS LIST

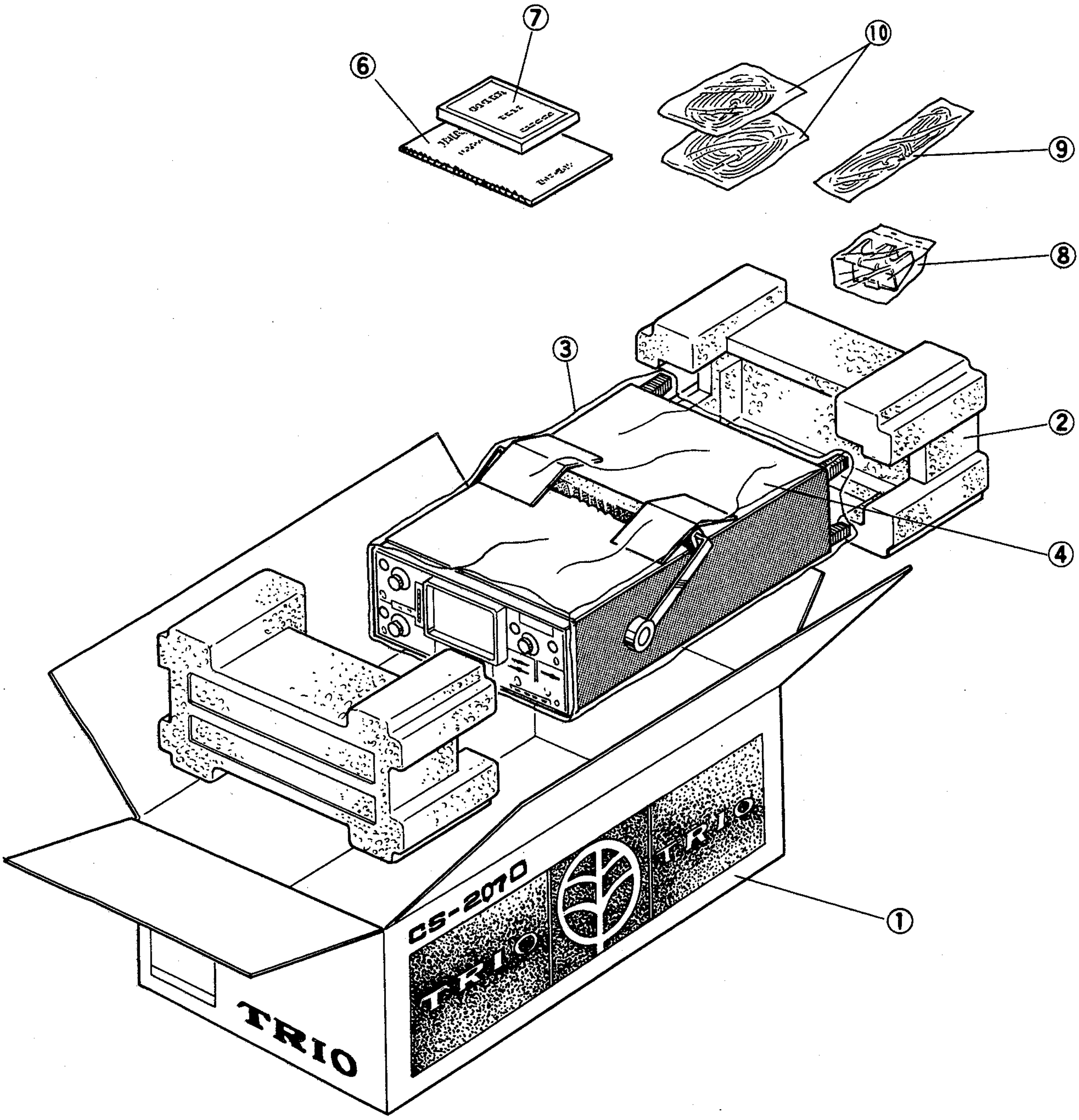

Fig. & Index No.	Ref. No.	Parts No.	Name & Description	Serial No. Eff.	
7-1		H01-2978-04	Carton box		
7-2		H10-2812-12	Pad (Formed styrene)		
7-3		H20-1713-14	Polyethylene bag		
7-4		H12-0531-04	Protective cover		
7-5		No use			
7-6		B50-2967-20	Instruction manual		
7-7		B50-2966-20	Instruction hand book		
7-8		J21-2903-03	Probe holder		
7-9		E30-1818-05	Power cord (JIS)		
		E30-1819-05	Power cord (CEE)		
		E30-1821-05	Power cord (SAA)		
7-10		Y87-1250-00	Probe (PC-29)		

PARTS LIST

Fig. & Index No.	Ref. No.	Parts No.	Name & Description	Serial No. Eff.
			Thermister 4W-25V	
	R1	No use		
	R2	No use		
	R3	RD14BB2E105J	Carbon resistor, 1MΩ, ±5%, 1/4W	
	R4	RD14BB2E105J	Carbon resistor, 1MΩ, ±5%, 1/4W	
	R5	RD14BB2E220J	Carbon resistor, 22Ω, ±5%, 1/4W	
	R6	RD14BB2E220J	Carbon resistor, 22Ω, ±5%, 1/4W	
	R7	RD14BB2E220J	Carbon resistor, 22Ω, ±5%, 1/4W	
	R8	RD14BB2E220J	Carbon resistor, 22Ω, ±5%, 1/4W	
	R9	RD14BB2C220J	Carbon resistor, 22Ω, ±5%, 1/8W	
	R10	RD14BB2C220J	Carbon resistor, 22Ω, ±5%, 1/8W	
	R11	RD14BB2E471J	Carbon resistor, 470Ω, ±5%, 1/4W	
	R12	RD14BB2E471J	Carbon resistor, 470Ω, ±5%, 1/4W	
	R13	RD14BB2E153J	Carbon resistor, 15 kΩ, ±5%, 1/4W	
	C1	C91-0501-05	Metalised film capacitor, 0.047µF, 630 WV	
	C2	C91-0501-05	Metalised film capacitor, 0.047µF, 630 WV	
	C3	No use		
	C4	CK45E3D472P	Ceramic capacitor, 4700pF, 2000 WV	
	C5	CK45E3D472P	Ceramic capacitor, 4700pF, 2000 WV	
	C6	CC45CH1H101J	Ceramic capacitor 100pF, ±5%	
	C7	CC45CH1H030C	Ceramic capacitor, 3pF, ±0.25pF	
	C8	CC45CH1H680J	Ceramic capacitor, 68pF, ±5%	
	C9	CC45CH1H680J	Ceramic capacitor, 68pF, ±5%	
	C10	C91-0551-05	Metalised film capacitor, 0.22µF, 630 WV	
		E23-0015-04	Earth lyg (For A TRIG, V ATT)	
		B40-2765-04	Name plate	
		B41-0730-04	Caution sheet	
		B41-0739-04	Caution sheet	
		B42-1835-04	Voltage indication sheet	
		B42-1836-04	Voltage indication sheet	
	J7	E31-0748-15	Leadwire with connector	
	J8	E31-0749-15	Leadwire with connector	
	J9	E31-0750-15	Leadwire with connector	
	J10	E31-0751-25	Leadwire with connector	
	J12	E31-0797-25	Leadwire with connector	
		E31-2340-05	Leadwire with connector	
	J31	E31-0752-05	Leadwire with connector	
	J32	E31-2321-05	Leadwire with connector	
	J33	E31-0754-05	Leadwire with connector	
	J40	E31-2337-05	Leadwire with connector	
	J41	E31-2338-05	Leadwire with connector	
	J48	E31-2339-15	Leadwire with connector	
	J51	E31-2341-15	Leadwire with connector	
	J56	E31-0790-05	Leadwire with connector	
	J57	E31-0799-05	Leadwire with connector	
		E31-0564-05	Leadwire with connector	
		E31-2320-05	Leadwire with connector	
		E31-2323-05	Leadwire with connector	
		E31-2319-45	Wire harness	
		E40-0711-05	Pin connector 7P	
		E40-1811-05	Pin connector 18P	
		E40-1216-05	Pin connector 12P	
		E40-1516-05	Pin connector 15P	
		F11-0963-03	Shield case (for switching power supply)	
		L92-0103-05	Ferrite core	
	L4, 5	L40-2282-13	Axial coil	
		J61-0501-05	Supporter (For P.C.B.)	
		J19-1620-05	Cord keeper	
		J42-0520-04	Edging	
		J61-0049-05	Cable band	

PARTS LIST

VERTICAL ATTENUATOR UNIT X75-1120-01

Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
	R1	RD14BB2C470J	RD	47Ω		
	R2	RD14BB2C100J	RD	10Ω		
	R3	RD14BB2C220J	RD	22Ω		
B-2	R4	RN14BK2E5003F	RN	500kΩ	±1%	1/4W
B-2	R5	RN14BK2E1004F	RN	1MΩ	±1%	1/4W
B-3	R6	RD14BB2C560J	RD	56Ω		
B-3	R7	RN14BK2E7503F	RN	750kΩ	±1%	1/4W
B-3	R8	R92-0795-05	RD	333kΩ	±1%	1/2W
B-3	R9	RD14BB2C220J	RD	22Ω		
A-3	R10	RN14BK2E9003F	RN	900kΩ	±1%	1/4W
A-2	R11	RN14BK2E1113F	RN	111kΩ	±1%	1/4W
A-3	R12	RD14BB2C680J	RD	68Ω		
A-3	R13	RD14BB2C100J	RD	10Ω		
A-3	R14	RD14BB2C470J	RD	47Ω		
B-3	R15	RD14BB2C472J	RD	4.7kΩ		
C-2	R16	RD14BB2C472J	RD	4.7kΩ		
B-2	R17	RD14BB2C912J	RD	9.1kΩ		
B-2	R18	RD14BB2C470J	RD	47Ω		
C-3	R19	RD14BB2C181J	RD	180Ω		
B-3	R20	RN14BK2E9903F	RN	990kΩ	±1%	1/4W
B-3	R21	RN14BK2E1012F	RN	10.1kΩ	±1%	1/4W
B-3	R22	RN14BB2C101J	RD	100Ω		
B-3	R23	RD14BB2C220J	RD	22Ω		
B-3	R24	RD14BB2C820J	RD	82Ω		
B-3	R25	RD14BB2C122J	RD	1.2kΩ		
B-3	R26	RN14BK2E1004F	RN	1MΩ	±1%	1/4W
B-3	R27	RD14BB2E104J	RD	100kΩ	±5%	1/4W
C-2	R28	RN14BK2B1000F	RN	100Ω	±1%	1/8W
C-3	R29	RN14BK2B1000F	RN	100Ω	±1%	1/8W
C-3	R30	RD14BB2C101J	RD	100Ω		
C-2	R31	RD14BB2C101J	RD	100Ω		
C-3	R32	RN14BK2B7500F	RN	750Ω	±1%	1/8W
C-3	R33	RN14BK2B7500F	RN	750Ω	±1%	1/8W
C-3	R34	RN14BK2B7500F	RN	750Ω	±1%	1/8W
C-3	R35	RN14BK2B3300F	RN	330Ω	±1%	1/8W
	R36	No use				
	R37	No use				
	R38	No use				
	R39	No use				
	R40	No use				
	R41	No use				
C-3	R42	RD14BB2C121J	RD	120Ω		
	R43	RD14BB2C470J	RD	47Ω		
	R44	RD14BB2C100J	RD	10Ω		
	R45	RD14BB2C220J	RD	22Ω		
B-1	R46	RN14BK2E5003F	RN	500kΩ	±1%	1/4W
B-1	R47	RN14BK2E1004F	RN	1MΩ	±1%	1/4W
B-1	R48	RD14BB2C560J	RD	56Ω		
B-1	R49	RN14BK2E7503F	RN	750kΩ	±1%	1/4W
B-2	R50	R92-0795-05	RD	333kΩ	±1%	1/2W
B-1	R51	RD14BB2C220J	RD	22Ω		
A-1	R52	RN14BK2E9003F	RN	900kΩ	±1%	1/4W
A-1	R53	RN14BK2E1113F	RN	111kΩ	±1%	1/4W
A-1	R54	RD14BB2C680J	RD	68Ω		
A-1	R55	RD14BB2C100J	RD	10Ω		
A-1	R56	RD14BB2C220J	RD	22Ω		
C-1	R57	RD14BB2C181J	RD	180Ω		
B-1	R58	RD14BB2C912J	RD	9.1kΩ		
B-1	R59	RD14BB2C470J	RD	47Ω		
C-1	R60	RD14BB2C472J	RD	4.7kΩ		
D-1	R61	RD14BB2C472J	RD	4.7kΩ		
B-1	R62	RN14BK2E9903F	RN	990kΩ	±1%	1/4W
B-2	R63	RN14BK2E1012F	RN	10.1kΩ	±1%	1/4W
B-1	R64	RD14BB2C101J	RD	100Ω		
B-2	R65	RD14BB2C220J	RD	22Ω		
B-1	R66	RD14BB2C820J	RD	82Ω		
B-1	R67	RD14BB2C122J	RD	1.2kΩ		
B-1	R68	RN14BK2E1004F	RN	1MΩ	±1%	1/4W
B-1	R69	RD14BB2E104J	RN	100Ω	±1%	1/8W
C-1	R70	RN14BK2B1000F	RN	100Ω	±1%	1/8W
C-1	R71	RN14BK2B1000F	RN	100Ω	±1%	1/8W
C-1	R72	RD14BB2C101J	RD	100Ω		
C-1	R73	RD14BB2C101J	RD	100Ω		
C-2	R74	RN14BK2B7500F	RN	750Ω	±1%	1/8W
C-1	R75	RN14BK2B7500F	RN	750Ω	±1%	1/8W
C-2	R76	RN14BK2B7500F	RN	750Ω	±1%	1/8W
C-2	R77	RN14BK2B3300F	RN	330Ω	±1%	1/8W
	R78	No use				
	R79	No use				
	R80	No use				
	R81	No use				
	R82	No use				
	R83	No use				
C-2	R84	RD14BBsC121J	RD	120Ω		
D-3	R85	RD14BB2C224J	RD	220kΩ		
D-3	R86	RD14BB2C224J	RD	220kΩ		
D-3	R87	RD14BB2C224J	RD	220kΩ		
D-3	R88	RD14BB2C224J	RD	220kΩ		
D-3	R89	RD14BB2C224J	RD	220kΩ		
E-3	R90	RD14BB2C224J	RD	220kΩ		
D-3	R91	RD14BB2C224J	RD	220kΩ		
D-2	R92	RD14BB2C224J	RD	220kΩ		
B-2	R93	RD14BB2C224J	RD	220kΩ		
D-3	R94	RD14BB2C824J	RD	820kΩ		
D-3	R95	RD14BB2C824J	RD	820kΩ		
D-3	R96	RD14BB2C824J	RD	820kΩ		
D-3	R97	RD14BB2C824J	RD	820kΩ		
D-3	R98	RD14BB2C824J	RD	820kΩ		
D-3	R99	RD14BB2C824J	RD	820kΩ		
D-3	R100	RD14BB2C824J	RD	820kΩ		
D-1	R101	RD14BB2C824J	RD	820kΩ		
D-2	R102	RD14BB2C824J	RD	820kΩ		
E-2	R103	RD14BB2C473J	RD	47kΩ		
E-2	R104	RD14BB2C473J	RD	47kΩ		
E-2	R105	RD14BB2C274J	RD	270kΩ		
E-2	R106	RD14BB2C274J	RD	270kΩ		
E-2	R107	RD14BB2C274J	RD	270kΩ		
E-2	R108	RD14BB2C473J	RD	47kΩ		
E-2	R109	RD14BB2C473J	RD	47kΩ		
D-2	R110	RD14BB2C473J	RD	47kΩ		
D-1	R111	RD14BB2C393J	RD	39kΩ		
D-3	R112	RD14BB2C391J	RD	390Ω		
D-3	R113	RD14BB2C391J	RD	390Ω		
D-3	R114	RD14BB2C391J	RD	390Ω		
D-3	R115	RD14BB2C391J	RD	390Ω		
D-3	R116	RD14BB2C391J	RD	390Ω		
D-3	R117	RD14BB2C391J	RD	390Ω		
D-3	R118	RD14BB2C391J	RD	390Ω		
D-1	R119	RD14BB2C391J	RD	390Ω		
D-1	R120	RD14BB2C391J	RD	390Ω		
	R121	No use				
	R122	No use				
D-2	R123	RD14BB2C100J	RD	10Ω		
	R124	RD14BB2C680J	RD	68Ω		
C-3	R125	RN14BK2B1000F	RN	100Ω	±1%	1/8W
	R126	No use				
A-1	R127	RD14BB2C101J	RD	100Ω		
C-1	R128	RN14BK2B1000F	RN	100Ω	±1%	1/8W
E-1	R129	RD14BB2C153J	RD	15kΩ		
E-2	R130	RD14BB2C824J	RD	820kΩ		

PARTS LIST

X75-1120-01

Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
E-1	R131	RD14BB2C824J	RD	820kΩ		
	R132	No use				
C-1	R133	RN14BK2B47ROF	RN	47Ω	±1%	1/8W
C-3	R134	RN14BK2B47ROF	RN	47Ω	±1%	1/8W
	R135	RD14BB2C680J	RD	68Ω		
C-2	R136	RN14BK2B47ROF	RN	47Ω	±1%	1/8W
A-3	R137	RD14BB2C101J	RD	100Ω		
C-3	R138	RN14BK2B47ROF	RN	47Ω	±1%	1/8W
A-3	R139	RD14BB2C220J	RD	22Ω		
A-1	R140	RD14BB2C220J	RD	22Ω		
C-3	R141	RD14BB2C824J	RD	820kΩ		
C-1	R142	RD14BB2C100J	RD	10Ω		
C-2	R143	RD14BB2C100J	RD	10Ω		
	R144	RD14BB2C101J	RD	100Ω		
	R145	RD14BB2C101J	RD	100Ω		
C-3	VR1	R12-0421-05	VR	100Ω		
C-2	VR2	R12-0421-05	VR	100Ω		
	C1	CC45CH1H470J	CC	47pF	±5%	
	C2	CC45CH1H470J	CC	47pF	±5%	
	C3	CC45CH1H470J	CC	47pF	±5%	
A-2	C4	CM93BD2A100D	CM	10pF	±0.5pF	100WV
B-2	C5	CK45B1H103K	CK	0.01μF	±10%	
B-2	C6	CM93BD2A221J	CM	220pF	±5%	100WV
	C7	No use				
B-3	C8	C91-0502-05	MF	0.01μF		630WV
C-2	C9	CK45B1H103K	CK	0.01μF	±10%	
C-3	C10	CK45B1H103K	CK	0.01μF	±10%	
C-2	C11	CE04W1C330M	CE	33μF		16WV
C-2	C12	CK45B1H103K	CK	0.01μF	±10%	
C-3	C13	CK45B1H103K	CK	0.01μF	±10%	
C-2	C14	CE04W1E101M	CE	100μF		25WV
C-2	C15	CK45B1H103K	CK	0.01μF	±10%	
C-2	C16	CE04W1E101M	CE	100μF		25WV
C-3	C17	CC45CH1H100D	CC	10pF	±0.5pF	
	C18	CC45CH1H470J	CC	47pF	±5%	
	C19	CC45CH1H470J	CC	47pF	±5%	
	C20	No use				
A-1	C21	CM93BD2A100D	CM	10pF	±0.5pF	100WV
C-1	C22	CK45B1H103K	CK	0.01μF	±10%	
B-1	C23	CM93BD2A221J	CM	220pF	±5%	100WV
B-1	C24	CC45CH1H390J	CC	39pF	±5%	
B-1	C25	C91-0502-05	MF	0.01μF		630WV
C-1	C26	CK45B1H103K	CK	0.01μF	±10%	
B-2	C27	CC45CH1H330J	CC	33pF	±5%	
C-1	C28	CE04W1C330M	CE	33μF		16WV
C-1	C29	CC45CH1H150J	CC	15pF	±5%	
C-2	C30	CK45B1H103K	CK	0.01μF	±10%	
C-2	C31	CE04W1E101M	CE	100μF		25WV
C-2	C32	CE04W1E101M	CE	100μF		25WV
C-1	C33	CK45B1H103K	CK	0.01μF	±10%	
C-1	C34	CK45B1H103K	CK	0.01μF	±10%	
C-2	C35	CC45CH1H100D	CC	10pF	±0.5pF	
D-3	C36	CC45CH1H101J	CC	100pF	±5%	
D-3	C37	CC45CH1H101J	CC	100pF	±5%	
D-3	C38	CC45CH1H101J	CC	100pF	±5%	
D-3	C39	CC45CH1H101J	CC	100pF	±5%	
D-3	C40	CC45CH1H101J	CC	100pF	±5%	
D-3	C41	CC45CH1H101J	CC	100pF	±5%	
D-3	C42	CC45CH1H101J	CC	100pF	±5%	
D-2	C43	CC45CH1H101J	CC	100pF	±5%	
D-2	C44	CC45CH1H101J	CC	100pF	±5%	
E-2	C45	CK45B1H222K	CK	2200pF	±10%	
E-2	C46	CK45B1H222K	CK	2200pF	±10%	

Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
E-2	C47	CK45B1H472K	CK	4700pF	±10%	
D-1	C48	CC45CH1H101J	CC	100pF	±5%	
C-3	C49	CC45CH1H150J	CC	15pF	±5%	
	C50	No use				
B-2	C51	CK45B1H103K	CK	0.01μF	±10%	
D-2	C52	CK45B1H102K	CK	1000pF	±10%	
	C53	CC45CH1H470J	CC	47pF	±5%	
A-1	C54	CC45CH1H090D	CC	9pF	±0.5pF	
D-1	C55	CK45B1H102K	CK	1000pF	±10%	
B-2	C56	CC45CH1H010C	CC	1pF	±0.25pF	
B-1	C57	CK45B1H103K	CK	0.01μF	±10%	
B-3	C58	CC45CH1H330J	CC	33pF	±5%	
	C59	No use				
	C60	No use				
A-3	C61	CC45CH1H090D	CC	9pF	±0.5pF	
B-2	C62	CC45CH1H390J	CC	39pF	±5%	
	C63	No use				
B-1	C64	CC45CH1H010C	CC	1pF	±0.25pF	
C-2	C65	CE04W1C330M	CE	33μF		16WV
	C66	No use				
B-1	C67	CK45B1H103K	CK	0.01μF	±10%	
A-3	C68	CC45CH1H101J	CC	100pF	±5%	
A-3	C69	CK45B1H103K	CK	0.01μF	±10%	
A-2	C70	CC45CH1H101J	CC	100pF	±5%	
A-2	C71	CK45B1H103K	CK	0.01μF	±10%	
	C72	No use				
C-1	C73	CE04W1C330M	CE	33μF		16WV
A-3	C74	CC45CH1H020C	CC	2pF	±0.25pF	
A-1	C75	CC45CH1H020C	CC	2pF	±0.25pF	
B-3	C76	CC45CH1H030C	CC	3pF	±0.25pF	
B-2	C77	CC45CH1H030C	CC	3pF	±0.25pF	
	C78	No use				
	C79	No use				
	C80	No use				
	C81	No use				
	C82	CC45CH1H030C	CC	3pF	±0.25pF	
	C83	CC45CH1H030C	CC	3pF	±0.25pF	
B-2	TC1	C05-0030-15	TC	20pF		
B-3	TC2	C05-0030-15	TC	20pF		
A-2	TC3	C05-0030-15	TC	20pF		
B-3	TC4	C05-0030-15	TC	20pF		
B-3	TC5	C05-0062-05	TC	6pF		
A-2	TC6	C05-0062-05	TC	6pF		
A-3	TC7	C05-0309-05	TC	40pF		
B-2	TC8	C05-0030-15	TC	20pF		
	TC9	No use				
B-3	TC10	C05-0062-05	TC	6pF		
C-3	TC11	C05-0030-05	TC	20pF		
B-1	TC12	C05-0030-15	TC	20pF		
B-1	TC13	C05-0030-15	TC	20pF		
A-1	TC14	C05-0030-15	TC	20pF		
B-1	TC15	C05-0030-15	TC	20pF		
B-1	TC16	C05-0062-05	TC	6pF		
A-1	TC17	C05-0062-05	TC	6pF		
A-1	TC18	C05-0309-05	TC	40pF		
B-2	TC19	C05-0030-15	TC	20pF		
	TC20	No use				
B-1	TC21	C05-0062-05	TC	6pF		
C-2	TC22	C05-0030-05	TC	20pF		
B-3	TC23	C05-0062-05	TC	6pF		
B-1	TC24	C05-0062-05	TC	6pF		
C-3	L1	L40-1001-02	Ferri-inductor	10μH		
C-3	L2	L40-1001-02	Ferri-inductor	10μH		

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description
C-1	L3	L40-1001-02	Ferri-inductor 10μH
C-1	L4	L40-1001-02	Ferri-inductor 10μH
B-2	D1		Diode Silicon 1S1544A
B-2	D2		Diode Silicon 1S1544A
B-1	D3		Diode Silicon 1S1544A
B-1	D4		Diode Silicon 1S1544A
D-2	D5		Diode Silicon DS442X
D-2	D6		Diode Silicon DS442X
D-2	D7		Diode Silicon DS442X
D-2	D8		Diode Silicon DS442X
D-2	D9		Diode Silicon DS442X
D-2	D10		Diode Silicon DS442X
D-2	D11		Diode Silicon DS442X
C-2	D12		Diode Zener YZ-120
C-2	D13		Diode Zener YZ-120
C-1	D14		Diode Zener YZ-120
D-1	D15		Diode Zener YZ-120
C-2	Q1		FET Dual DN1901
C-1	Q2		FET Dual DN1901
D-2	IC1		IC Digital MC14584BCP
D-2	IC2		IC Digital MC14584BCP
D-2	IC3		IC Digital MC10014BCP
D-2	IC4		IC Linear MC14027BCP
E-3	IC5		IC Linear SN7404N
E-2	IC6		IC Digital MC14174BCP
D-1	IC7		IC Digital MC14081BCP
E-2	IC8		IC Linear MC14503BCP
E-2	IC9		IC Digital SN7432N
D-1	IC10		IC Digital MC14027BCP
E-1	IC11		IC Digital MC14503BCP
C-3	IC12		IC Linear ATM-4010
C-1	IC13		IC Linear ATM-4010
D-2	P1	E40-1817-05	Pin connector 18P
D-1	P2	E40-0717-05	Pin connector 7P
C-3	P3	E40-0611-05	Pin connector 6P
C-1	P4	E40-0611-05	Pin connector 6P
E-3	P5	E40-1277-05	Pin connector 12P
E-1	P6	E40-0577-05	Pin connector 5P
		E23-0521-04	Earth terminal
		E29-0504-05	Teflon terminal
A-3	S1a	S01-4503-05	Rotary switch
B-3	S1b	S01-4503-05	Rotary switch
B-3	S1c	S01-4503-05	Rotary switch
B-3	S1d	S01-4503-05	Rotary switch
B-3	S1e	S01-4503-05	Rotary switch
	S1f	S01-4503-05	Rotary switch
	S1g	S01-4503-05	Rotary switch
	S1h	S01-4503-05	Rotary switch
A-1	S2a	S01-4503-05	Rotary switch
B-1	S2b	S01-4503-05	Rotary switch
B-1	S2c	S01-4503-05	Rotary switch
B-1	S2d	S01-4503-05	Rotary switch
B-1	S2e	S01-4503-05	Rotary switch
	S2f	S01-4503-05	Rotary switch
	S2g	S01-4503-05	Rotary switch
	S2h	S01-4503-05	Rotary switch

VERTICAL PREAMPLIFIER UNIT X73-1320-01

Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
B-3	R1	RD14BB2C220J	RD	22Ω		
B-3	R2	RD14BB2C220J	RD	22Ω		
B-3	R3	RN14BK2B1500F	RN	150Ω	±1%	1/8W
B-3	R4	RD14BB2C121J	RD	120Ω		
B-3	R5	RD14BB2C472J	RD	4.7kΩ		
B-3	R6	RN14BK2B2700F	RN	270Ω	±1%	1/8W
B-3	R7	RD14BB2C101J	RD	100Ω		
B-3	R8	RN14BK2B2700F	RN	270Ω	±1%	1/8W
B-2	R9	RD14BB2C112J	RD	1.1kΩ		
B-2	R10	RD14BB2C392J	RD	3.9kΩ		
B-2	R11	RD14BB2C220J	RD	22Ω		
B-3	R12	RD14BB2C220J	RD	22Ω		
B-3	R13	RN14BK2B3001F	RN	3kΩ	±1%	1/8W
B-3	R14	RN14BK2B1801F	RN	1.8kΩ	±1%	1/8W
B-3	R15	RN14BK2B3000F	RN	300Ω	±1%	1/8W
B-3	R16	RN14BK2B7500F	RN	750Ω	±1%	1/8W
B-2	R17	RN14BK2B7500F	RN	750Ω	±1%	1/8W
B-3	R18	RN14BK2B5601F	RN	5.6kΩ	±1%	1/8W
B-3	R19	RN14BK2B5601F	RN	5.6kΩ	±1%	1/8W
B-3	R20	RN14BK2B3601F	RN	3.6kΩ	±1%	1/8W
B-3	R21	RN14BK2B3601F	RN	3.6kΩ	±1%	1/8W
B-3	R22	RN14BK2B1501F	RN	1.5kΩ	±1%	1/8W
B-3	R23	RN14BK2B1501F	RN	1.5kΩ	±1%	1/8W
B-3	R24	RD14BB2C220J	RD	22Ω		
B-2	R25	RD14BB2C220J	RD	22Ω		
B-3	R26	RD14BB2C821J	RD	820Ω		
B-3	R27	RN14BK2B4700F	RN	470Ω	±1%	1/8W
B-3	R28	RN14BK2B4700F	RN	470Ω	±1%	1/8W
B-3	R29	RN14BK2B51R0F	RN	51Ω	±1%	1/8W
C-2	R30	RD14BB2C103J	RD	10kΩ		
C-2	R31	RD14BB2C472J	RD	4.7kΩ		
C-2	R32	RD14BB2C472J	RD	4.7kΩ		
C-2	R33	RD14BB2C103J	RD	10kΩ		
C-2	R34	RD14BB2C821J	RD	820Ω		
C-3	R35	RN14BK2B47R0F	RN	47Ω	±1%	1/8W
C-3	R36	RN14BK2B4300F	RN	430Ω	±1%	1/8W
C-3	R37	RN14BK2B4300F	RN	430Ω	±1%	1/8W
C-3	R38	RD14BB2C221J	RD	220Ω		
	R39	No use				
C-3	R40	RN14BK2B1500F	RN	150Ω	±1%	1/8W
C-3	R41	RN14BK2B4300F	RN	430Ω	±1%	1/8W
C-3	R42	RN14BK2B4300F	RN	430Ω	±1%	1/8W
	R43	No use				
C-3	R44	RD14BB2C220J	RD	22Ω		
C-3	R45	RD14BB2C220J	RD	22Ω		
C-3	R46	RN14BK2B1500F	RN	150Ω	±1%	1/8W
C-3	R47	RD14BB2C123J	RD	12kΩ		
C-2	R48	RD14BB2C330J	RD	33Ω		
D-2	R49	RD14BB2C472J	RD	4.7kΩ		
C-3	R50	RN14BK2B9100F	RN	910Ω	±1%	1/8W
C-2	R51	RN14BK2B9100F	RN	910Ω	±1%	1/8W
C-3	R52	RD14BB2C470J	RD	47Ω		
C-2	R53	RD14BB2C470J	RD	47Ω		
C-3	R54	RN14BK2B3000F	RN	300Ω	±1%	1/8W
C-2	R55	RD14BB2C103J	RD	10kΩ		
C-3	R56	RN14BK2B8200F	RN	820Ω	±1%	1/8W
C-2	R57	RN14BK2B8200F	RN	820Ω	±1%	1/8W
C-3	R58	RD14BB2C682J	RD	6.8kΩ		
C-3	R59	RN14BK2B3600F	RN	360Ω	±1%	1/8W
C-3	R60	RN14BK2B4700F	RN	470Ω	±1%	1/8W
C-3	R61	RN14BK2B4700F	RN	470Ω	±1%	1/8W
C-3	R62	RN14BK2B1801F	RN	1.8kΩ	±1%	1/8W
C-3	R63	RD14BB2C220J	RD	22Ω		
C-3	R64	RD14BB2C220J	RD	22Ω		
D-3	R65	RD14BB2C820J	RD	820Ω		

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
D-3	R66	RD14BB2C430J	RD	43Ω		
D-2	R67	RN14BK2B4700F	RN	470Ω	±1%	1/8W
C-2	R68	RN14BK2B4700F	RN	470Ω	±1%	1/8W
C-2	R69	RN14BK2B3600F	RN	360Ω	±1%	1/8W
C-2	R70	RN14BK2B1601F	RN	1.6kΩ	±1%	1/8W
C-2	R71	RD14BB2C220J	RD	22Ω		
D-2	R72	RD14BB2C821J	RD	820Ω		
D-2	R73	RD14BB2C430J	RD	43Ω		
D-3	R74	RD14BB2C220J	RD	22Ω		
D-2	R75	RD14BB2C220J	RD	22Ω		
D-2	R76	RD14BB2C132J	RD	1.3kΩ		
D-2	R77	RD14BB2C392J	RD	3.9kΩ		
D-3	R78	RD14BB2C220J	RD	22Ω		
D-2	R79	RD14BB2C220J	RD	22Ω		
D-2	R80	RD14BB2C101J	RD	100Ω		
D-3	R81	RD14BB2C101J	RD	100Ω		
D-2	R82	RD14BB2C101J	RD	100Ω		
D-3	R83	RD14BB2C102J	RD	1kΩ		
D-2	R84	RD14BB2C432J	RD	4.3kΩ		
D-3	R85	RD14BB2C472J	RD	4.7kΩ		
D-1	R86	RD14BB2C472J	RD	4.7kΩ		
	R87	No use				
D-3	R88	RD14BB2C102J	RD	1kΩ		
D-3	R89	RD14BB2C432J	RD	4.3kΩ		
D-3	R90	RD14BB2C101J	RD	100Ω		
D-3	R91	RD14BB2C101J	RD	100Ω		
D-3	R92	RD14BB2C101J	RD	100Ω		
D-3	R93	RD14BB2C220J	RD	22Ω		
D-3	R94	RD14BB2C220J	RD	22Ω		
D-3	R95	RD14BB2C132J	RD	1.3kΩ		
D-3	R96	RD14BB2C392J	RD	3.9kΩ		
D-3	R97	RD14BB2C220J	RD	22Ω		
D-1	R98	RD14BB2C220J	RD	22Ω		
E-3	R99	RN14BK2B3600F	RN	360Ω	±1%	1/8W
E-3	R100	RN14BK2B4700F	RN	470Ω	±1%	1/8W
E-3	R101	RN14BK2B4700F	RN	470Ω	±1%	1/8W
E-3	R102	RN14BK2B1801F	RN	1.8kΩ	±1%	1/8W
E-3	R103	RD14BB2C220J	RD	22Ω		
E-3	R104	RD14BB2C220J	RD	22Ω		
E-3	R105	RD14BB2C821J	RD	820Ω		
E-3	R106	RD14BB2C430J	RD	43Ω		
E-3	R107	RN14BK2B8200F	RN	820Ω	±1%	1/8W
E-3	R108	RN14BK2B8200F	RN	820Ω	±1%	1/8W
E-3	R109	RD14BB2C391J	RD	390Ω		
E-3	R110	RN14BK2B1001F	RN	1kΩ	±1%	1/8W
D-3	R111	RD14BB2C470J	RD	47Ω		
D-3	R112	RD14BB2C470J	RD	47Ω		
E-3	R113	RN14BK2B7500F	RN	750Ω	±1%	1/8W
D-3	R114	RN14BK2B7500F	RN	750Ω	±1%	1/8W
D-3	R115	RD14BB2C221J	RD	220Ω		
D-3	R116	RD14BB2C273J	RD	27kΩ		
D-3	R117	RD14BB2C103J	RD	10kΩ		
E-3	R118	RN14BK2B2400F	RN	240Ω	±1%	1/8W
D-3	R119	RD14BB2C151J	RD	150Ω		
D-3	R120	RD14BB2C151J	RD	150Ω		
E-3	R121	RD14BB2C510J	RD	51Ω		
E-3	R122	RD14BB2C510J	RD	51Ω		
D-2	R123	RD14BB2C103J	RD	10kΩ		
D-2	R124	RD14BB2C223J	RD	22kΩ		
D-2	R125	RD14BB2C223J	RD	22kΩ		
D-2	R126	RD14BB2C472J	RD	4.7kΩ		
D-2	R127	RD14BB2C472J	RD	4.7kΩ		
D-2	R128	RD14BB2C473J	RD	47kΩ		
D-2	R129	RD14BB2C473J	RD	47kΩ		
D-2	R130	RD14BB2C331J	RD	330Ω		
D-2	R131	RD14BB2C472J	RD	4.7kΩ		
D-2	R132	RD14BB2C103J	RD	10kΩ		
D-2	R133	RN14BK2B4300F	RN	430Ω	±1%	1/8W
D-2	R134	RN14BK2B4300F	RN	430Ω	±1%	1/8W
D-2	R135	RN14BK2B4300F	RN	430Ω	±1%	1/8W
D-2	R136	RN14BK2B4300F	RN	430Ω	±1%	1/8W
E-2	R137	RN14BK2B8200F	RN	820Ω	±1%	1/8W
D-2	R138	RN14BK2B8200F	RN	820Ω	±1%	1/8W
	R139	No use				
E-2	R140	RN14BK2B3900F	RN	390Ω	±1%	1/8W
D-2	R141	RN14BK2B3600F	RN	360Ω	±1%	1/8W
E-2	R142	RN14BK2B4700F	RN	470Ω	±1%	1/8W
E-2	R143	RN14BK2B4700F	RN	470Ω	±1%	1/8W
D-2	R144	RN14BK2B1801F	RN	1.8kΩ	±1%	1/8W
D-2	R145	RD14BB2C220J	RD	22Ω		
D-2	R146	RD14BB2C220J	RD	22Ω		
D-2	R147	RD14BB2C821J	RD	820Ω		
D-2	R148	RD14BB2C430J	RD	43Ω		
D-2	R149	RD14BB2C220J	RD	22Ω		
E-2	R150	RD14BB2C220J	RD	22Ω		
E-2	R151	RN14BK2B1101F	RN	1.1kΩ	±1%	1/8W
E-2	R152	RN14BK2B9100F	RN	910Ω	±1%	1/8W
E-2	R153	RN14BK2B9100F	RN	910Ω	±1%	1/8W
E-2	R154	RN14BK2B1101F	RN	1.1kΩ	±1%	1/8W
E-2	R155	RN14BK2B3300F	RN	330Ω	±1%	1/8W
E-2	R156	RN14BK2B3300F	RN	330Ω	±1%	1/8W
E-2	R157	RN14BK2B1001F	RN	1kΩ	±1%	1/8W
E-2	R158	RN14BK2B2200F	RN	220Ω	±1%	1/8W
E-2	R159	RN14BK2B1001F	RN	1kΩ	±1%	1/8W
E-2	R160	RN14BK2B7500F	RN	750Ω	±1%	1/8W
E-2	R161	RN14BK2B7500F	RN	750Ω	±1%	1/8W
E-2	R162	RD14BB2C470J	RD	47Ω		
E-2	R163	RD14BB2C470J	RD	47Ω		
B-1	R164	RD14BB2C220J	RD	22Ω		
B-1	R165	RD14BB2C220J	RD	22Ω		
C21	R166	RN14BK2B1500F	RN	150Ω	±1%	1/8W
B-2	R167	RD14BB2C241J	RD	240Ω		
B-2	R168	RD14BB2C681J	RD	680Ω		
B-2	R169	RN14BK2B2700F	RN	270Ω	±1%	1/8W
B-2	R170	RN14BK2B2700F	RN	270Ω	±1%	1/8W
B-2	R171	RN14BK2B1801F	RN	1.8kΩ	±1%	1/8W
B-2	R172	RN14BK2B5601F	RN	5.6kΩ	±1%	1/8W
B-2	R173	RN14BK2B1801F	RN	1.8kΩ	±1%	1/8W
B-2	R174	RN14BK2B5101F	RN	5.1kΩ	±1%	1/8W
B-2	R175	RN14BK2B3000F	RN	300Ω	±1%	1/8W
B-2	R176	RD14BB2C331J	RD	330Ω		
B-2	R177	RN14BK2B2201F	RN	2.2kΩ	±1%	1/8W
B-2	R178	RN14BK2B6801F	RN	6.8kΩ	±1%	1/8W
B-2	R179	RN14BK2B2201F	RN	2.2kΩ	±1%	1/8W
D-2	R180	RD14BB2C273J	RD	27kΩ		
B-1	R181	RD14BB2C220J	RD	22Ω		
B-1	R182	RD14BB2C220J	RD	22Ω		
B-1	R183	RD14BB2C112J	RD	1.1kΩ		
B-1	R184	RD14BB2C392J	RD	3.9kΩ		
B-1	R185	RD14BB2C220J	RD	22Ω		
B-1	R186	RD14BB2C220J	RD	22Ω		
B-1	R187	RD14BB2C112J	RD	1.1kΩ		
B-1	R188	RD14BB2C392J	RD	3.9kΩ		
B-1	R189	RN14BK2B7500F	RN	750Ω	±1%	1/8W
B-1	R190	RN14BK2B7500F	RN	750Ω	±1%	1/8W
B-1	R191	RN14BK2B5601F	RN	5.6kΩ	±1%	1/8W
B-1	R192	RN14BK2B5601F	RN	5.6kΩ	±1%	1/8W
B-1	R193	RN14BK2B3601F	RN	3.6kΩ	±1%	1/8W
B-1	R194	RN14BK2B3601F	RN	3.6kΩ	±1%	1/8W
B-1	R195	RN14BK2B1501F	RN	1.5kΩ	±1%	1/8W

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
B-1	R196	RN14BK2B1501F	RN	1.5kΩ	±1%	1/8W
B-2	R197	RD14BB2C220J	RD	22Ω		
B-1	R198	RD14BB2C220J	RD	22Ω		
B-1	R199	RD14BB2C102J	RD	1kΩ		
B-1	R200	RN14BK2B4700F	RN	470Ω	±1%	1/8W
B-1	R201	RN14BK2B4700F	RN	470Ω	±1%	1/8W
B-2	R202	RN14BK2B51R0F	RN	51Ω	±1%	1/8W
C-2	R203	RD14BB2C103J	RD	10kΩ		
C-2	R204	RD14BB2C472J	RD	4.7kΩ		
C-2	R205	RD14BB2C472J	RD	4.7kΩ		
C-2	R206	RD14BB2C103J	RD	10kΩ		
C-2	R207	RD14BB2C821J	RD	820Ω		
C-2	R208	RN14BK2B47R0F	RN	47Ω	±1%	1/8W
C-1	R209	RN14BK2B4300F	RN	430Ω	±1%	1/8W
C-1	R210	RN14BK2B4300F	RN	430Ω	±1%	1/8W
C-1	R211	RD14BB2C301J	RD	300Ω		
	R212	No use				
C-1	R213	RN14BK2B1500F	RN	150Ω	±1%	1/8W
C-2	R214	RN14BK2B4300F	RN	430Ω	±1%	1/8W
C-1	R215	RN14BK2B4300F	RN	430Ω	±1%	1/8W
	R216	No use				
C-2	R217	RD14BB2C220J	RD	22Ω		
C-1	R218	RD14BB2C220J	RD	22Ω		
C-1	R219	RN14BK2B1500F	RN	150Ω	±1%	1/8W
C-1	R220	RD14BB2C123J	RD	12kΩ		
	R221	RD14BB2C330J	RD	33Ω		
C-1	R222	RD14BB2C682J	RD	6.8kΩ		
C-1	R223	RN14BK2B9100F	RN	910Ω	±1%	1/8W
C-1	R224	RN14BK2B9100F	RN	910Ω	±1%	1/8W
C-1	R225	RD14BB2C470J	RD	47Ω		
C-1	R226	RD14BB2C470J	RD	47Ω		
C-1	R227	RN14BK2B2000F	RN	200Ω	±1%	1/8W
C-1	R228	RD14BB2C471J	RD	470Ω		
C-1	R229	RN14BK2B8200F	RN	820Ω	±1%	1/8W
C-1	R230	RN14BK2B8200F	RN	820Ω	±1%	1/8W
C-2	R231	RN14BK2B3600F	RN	360Ω	±1%	1/8W
C-2	R232	RN14BK2B4700F	RN	470Ω	±1%	1/8W
C-2	R233	RN14BK2B4700F	RN	470Ω	±1%	1/8W
C-2	R234	RN14BK2B1801F	RN	1.8kΩ	±1%	1/8W
C-2	R235	RD14BB2C220J	RD	22Ω		
C-2	R236	RD14BB2C220J	RD	22Ω		
D-2	R237	RD14BB2C821J	RD	820Ω		
D-2	R238	RD14BB2C430J	RD	43Ω		
D-1	R239	RD14BB2C220J	RD	22Ω		
D-1	R240	RD14BB2C220J	RD	22Ω		
D-1	R241	RD14BB2C132J	RD	1.3kΩ		
D-1	R242	RD14BB2C392J	RD	3.9kΩ		
D-1	R243	RD14BB2C220J	RD	22Ω		
D-1	R244	RD14BB2C220J	RD	22Ω		
D-1	R245	RD14BB2C101J	RD	100Ω		
D-1	R246	RD14BB2C101J	RD	100Ω		
D-1	R247	RD14BB2C101J	RD	100Ω		
D-1	R248	RD14BB2C102J	RD	1kΩ		
D-1	R249	RD14BB2C432J	RD	4.3kΩ		
D-1	R250	RD14BB2C102J	RD	1kΩ		
D-1	R251	RD14BB2C432J	RD	4.3kΩ		
D-1	R252	RD14BB2C101J	RD	100Ω		
D-1	R253	RD14BB2C101J	RD	100Ω		
D-1	R254	RD14BB2C101J	RD	100Ω		
D-1	R255	RD14BB2C220J	RD	22Ω		
D-1	R256	RD14BB2C220J	RD	22Ω		
D-1	R257	RD14BB2C132J	RD	1.3kΩ		
D-1	R258	RD14BB2C392J	RD	3.9kΩ		
D-1	R259	RD14BB2C220J	RD	22Ω		
D-1	R260	RD14BB2C220J	RD	22Ω		

Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
E-1	R261	RN14BK2B3600F	RN	360Ω	±1%	1/8W
E-1	R262	RN14BK2B4700F	RN	470Ω	±1%	1/8W
E-1	R263	RN14BK2B4700F	RN	470Ω	±1%	1/8W
E-1	R264	RN14BK2B1801F	RN	1.8kΩ	±1%	1/8W
E-1	R265	RD14BB2C220J	RD	22Ω		
E-1	R266	RD14BB2C220J	RD	22Ω		
E-1	R267	RD14BB2C821J	RD	820Ω		
E-1	R268	RD14BB2C430J	RD	43Ω		
E-1	R269	RN14BK2B8200F	RN	820Ω	±1%	1/8W
E-1	R270	RN14BK2B8200F	RN	820Ω	±1%	1/8W
E-1	R271	RD14BB2C391J	RD	390Ω		
E-1	R272	RN14BK2B1001F	RN	1kΩ	±1%	1/8W
D-1	R273	RD14BB2C470J	RD	47Ω		
D-1	R274	RD14BB2C470J	RD	47Ω		
E-1	R275	RN14BK2B7500F	RN	750Ω	±1%	1/8W
D-1	R276	RN14BK2B7500F	RN	750Ω	±1%	1/8W
D-1	R277	RD14BB2C221J	RD	220Ω		
D-1	R278	RD14BB2C273J	RD	27kΩ		
D-1	R279	RD14BB2C103J	RD	10kΩ		
E-1	R280	RN14BK2B2400F	RN	240Ω	±1%	1/8W
D-1	R281	RD14BB2C151J	RD	150Ω		
D-1	R282	RD14BB2C151J	RD	150Ω		
E-1	R283	RD14BB2C510J	RD	51Ω		
E-1	R284	RD14BB2C510J	RD	51Ω		
E-2	R285	RD14BB2C472J	RD	4.7kΩ		
F-2	R286	RD14BB2C103J	RD	10kΩ		
F-2	R287	RD14BB2C103J	RD	10kΩ		
E-2	R288	RD14BB2C103J	RD	10kΩ		
E-2	R289	RD14BB2C103J	RD	10kΩ		
	R290	RD14BB2C103J	RD	10kΩ		
	R291	RD14BB2C272J	RD	2.7kΩ		
C-2	R292	RD14BB2C220J	RD	22Ω		
	R293	No use				
	R294	No use				
B-1	R295	RD14BB2C103J	RD	10kΩ		
	R296	No use				
	R297	No use				
	R298	No use				
E-2	R299	RD14BB2C222J	RD	2.2kΩ		
E-2	R300	RD14BB2C222J	RD	2.2kΩ		
E-2	R301	RD14BB2C222J	RD	2.2kΩ		
	R302	No use				
	R303	No use				
E-2	R304	RD14BB2C220J	RD	22Ω		
E-2	R305	RD14BB2C220J	RD	22Ω		
	R306	RD14BB2C101J	RD	100Ω		
B-3	R307	RN14BK2B1501F	RN	1.5kΩ	±1%	1/8W
B-1	R308	RN14BK2B1501F	RN	1.5kΩ	±1%	1/8W
C-2	R309	No use				
	R310	No use				
	R311	No use				
	R312	No use				
C-2	R313	RD14BB2C471J	RD	470Ω		
	R314	No use				
E-2	R315	RD14BB2C470J	RD	47Ω		
E-2	R316	RD14BB2C470J	RD	47Ω		
B-2	R317	RD14BB2C473J	RD	47kΩ		
B-1	R318	RD14BB2C473J	RD	47kΩ		
A-2	R319	RD14BB2C103J	RD	10kΩ		
A-2	R320	RD14BB2C822J	RD	8.2kΩ		
A-2	R321	RD14BB2C103J	RD	10kΩ		
A-2	R322	RD14BB2C103J	RD	10kΩ		
A-2	R323	RD14BB2C752J	RD	7.5kΩ		
A-2	R324	RD14BB2C332J	RD	3.3kΩ		
B-3	R325	RD14BB2C271J	RD	270Ω		

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
B-2	R326	RD14BB2C271J	RD	270Ω		
	R327	No use				
	R328	No use				
	R329	RD14BB2C471J	RD	470Ω		
C-3	R330	RD14BB2C100J	RD	10Ω		
C-1	R331	RD14BB2C100J	RD	10Ω		
C-3	R332	RD14BB2C1R0J	RD	1Ω		
D-3	R333	RD14BB2C470J	RD	47Ω		
D-1	R334	RD14BB2C470J	RD	47Ω		
E-3	VR1	R01-0512-05	VR	500Ω		
E-1	VR2	R01-0512-05	VR	500Ω		
B-3	VR3	R12-0421-05	VR	100Ω		
E-3	VR4	R12-0421-05	VR	100Ω		
C-3	VR5	R12-0421-05	VR	100Ω		
C-3	VR6	R12-0421-05	VR	100Ω		
C-3	VR7	R12-0540-05	VR	500Ω		
C-2	VR8	R12-0539-05	VR	200Ω		
C-2	VR9	R12-0540-05	VR	500Ω		
E-3	VR10	R12-0540-05	VR	500Ω		
E-3	VR11	R12-0421-05	VR	100Ω		
	VR12	No use				
E-2	VR13	R12-0421-05	VR	100Ω		
B-2	VR14	R12-0421-05	VR	100Ω		
B-2	VR15	R12-0421-05	VR	100Ω		
C-1	VR16	R12-0421-05	VR	100Ω		
C-1	VR17	R12-0421-05	VR	100Ω		
C-1	VR18	R12-0539-05	VR	200Ω		
C-1	VR19	R12-0540-05	VR	500Ω		
E-1	VR20	R12-0540-05	VR	500Ω		
E-1	VR21	R12-0421-05	VR	100Ω		
D-2	VR22	R12-0540-05	VR	500Ω		
B-3	C1	CC45CH1H120J	CC	12pF	±5%	
B-3	C2	CC45CH1H220J	CC	22pF	±5%	
B-3	C3	CK45B1H103K	CK	0.01μF	±10%	
B-3	C4	CK45B1H103K	CK	0.01μF	±10%	
B-3	C5	CC45CH1H030C	CC	3pF	±0.25pF	
	C6	No use				
B-2	C7	CK45B1H103K	CK	0.01μF	±10%	
C-2	C8	CK45B1H103K	CK	0.01μF	±10%	
C-3	C9	CC45CH1H330J	CC	33pF	±5%	
	C10	No use				
C-2	C11	CK45B1H222K	CK	2200pF	±10%	
	C12	No use				
D-3	C13	CC45CH1H270J	CC	27pF	±5%	
C-2	C14	CC45CH1H220J	CC	22pF	±5%	
C-3	C15	CK45B1H103K	CK	0.01μF	±10%	
C-2	C16	No use				
	C17	No use				
	C18	No use				
E-3	C19	CC45CH1H150J	CC	15pF	±5%	
E-3	C20	CC45CH1H070D	CC	7pF	±0.5pF	
D-3	C21	CK45B1H102K	CK	1000pF	±10%	
D-3	C22	CC45CH1H220J	CC	22pF	±5%	
E-3	C23	CC45CH1H680J	CC	68pF	±5%	
D-2	C24	CK45B1H103K	CK	0.01μF	±10%	
E-2	C25	CC45CH1H151J	CC	150pF	±5%	
D-2	C26	CC45CH1H151J	CC	150pF	±5%	
D-2	C27	CK45B1H103K	CK	0.01μF	±10%	
E-2	C28	CC45CH1H220J	CC	22pF	±5%	
	C29	No use				
	C30	No use				
E-2	C31	CC45CH1H020C	CC	2pF	±0.25pF	
E-2	C32	CC45CH1H050C	CC	5pF	±0.25pF	
	C33	No use				
D-3	C34	CC45CH1H100J	CC	10pF	±5%	
D-1	C35	CC45CH1H100J	CC	10pF	±5%	
E-2	C36	CC45CH1H070D	CC	7pF	±0.5pF	
E-2	C37	CC45CH1H070D	CC	7pF	±0.5pF	
B-2	C38	CC45CH1H270J	CC	27pF	±5%	
B-2	C39	CC45SL1H220J	CC	22pF	±5%	
B-1	C40	CK45B1H103K	CK	0.01μF	±10%	
B-1	C41	CK45B1H103K	CK	0.01μF	±10%	
B-2	C42	CC45CH1H030C	CC	3pF	±0.25pF	
	C43	No use				
C-2	C44	CK45B1H103K	CK	0.01μF	±10%	
C-2	C45	CK45B1H103K	CK	0.01μF	±10%	
C-1	C46	CC45CH1H330J	CC	33pF	±5%	
	C47	No use				
C-1	C48	CK45B1H222K	CK	2200pF	±10%	
	C49	No use				
C-1	C50	CC45CH1H390J	CC	39pF	±5%	
C-1	C51	CC45CH1H220J	CC	22pF	±5%	
C-1	C52	CC45CH1H120J	CC	12pF	±5%	
C-1	C53	CC45CH1H220J	CC	22pF	±5%	
	C54	No use				
	C55	No use				
E-1	C56	CC45CH1H150J	CC	15pF	±5%	
E-1	C57	CC45CH1H070D	CC	7pF	±0.5pF	
D-1	C58	CK45B1H102K	CK	1000pF	±10%	
D-1	C59	CC45CH1H220J	CC	22pF	±5%	
E-1	C60	CC45CH1H680J	CC	68pF	±5%	
B-2	C61	CK45B1H103K	CK	0.01μF	±10%	
B-3	C62	CK45B1H103K	CK	0.01μF	±10%	
B-2	C63	CE04W1C101M	CE	100μF		16WV
B-3	C64	CK45B1H103K	CK	0.01μF	±10%	
B-3	C65	CE04W1C101M	CE	100μF		16WV
B-2	C66	CK45B1H103K	CK	0.01μF	±10%	
C-2	C67	CE04W1C101M	CE	100μF		16WV
C-3	C68	CK45B1H103K	CK	0.01μF	±10%	
C-3	C69	CE04W1H010M	CE	1μF		50WV
C-3	C70	CE04W1C101M	CE	100μF		16WV
C-2	C71	CK45B1H103K	CK	0.01μF	±10%	
C-2	C72	CK45B1H103K	CK	0.01μF	±10%	
C-3	C73	CK45B1H103K	CK	0.01μF	±10%	
C-2	C74	CK45B1H103K	CK	0.01μF	±10%	
C-2	C75	CE04W1C101M	CE	100μF		16WV
C-2	C76	CE04W1C101M	CE	100μF		16WV
D-2	C77	CE04W1C331M	CE	330μF		16WV
D-3	C78	CE04W1C101M	CE	100μF		16WV
E-3	C79	CK45B1H103K	CK	0.01μF	±10%	
E-2	C80	CE04W1C331M	CE	330μF		16WV
E-3	C81	CE04W1C221M	CE	220μF		16WV
F-3	C82	CE04W1C471M	CE	470μF		16WV
E-2	C83	CE04W1C221M	CE	220μF		16WV
F-3	C84	CE04W1C470M	CE	47μF		16WV
B-1	C85	CK45B1H103K	CK	0.01μF	±10%	
D-1	C86	CK45B1H103K	CK	0.01μF	±10%	
B-1	C87	CK45B1H103K	CK	0.01μF	±10%	
B-1	C88	CE04W1C101M	CE	100μF		16WV
B-2	C89	CK45B1H103K	CK	0.01μF	±10%	
B-2	C90	CK45B1H103K	CK	0.01μF	±10%	
B-2	C91	CE04W1C101M	CE	100μF		16WV
B-1	C92	CK45B1H103K	CK	0.01μF	±10%	
B-1	C93	CE04W1C101M	CE	100μF		16WV
C-2	C94	CK45B1H103K	CK	0.01μF	±10%	
C-1	C95	CE04W1H010M	CE	1μF		50WV
C-2	C96	CK45B1H103K	CK	0.01μF	±10%	
C-2	C97	CK45B1H103K	CK	0.01μF	±10%	
C-2	C98	CE04W1C101M	CE	100μF		16WV
C-2	C99	CE04W1C101M	CE	100μF		16WV

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description
C-1	C100	CK45B1H103K	CK 0.01μF ±10%
C-1	C101	CE04W1C101M	CE 100μF 16WV
	C102	No use	
C-2	C103	CE04W1H010M	CE 1μF 50WV
D-1	C104	CE04W1C101M	CE 100μF 16WV
F-1	C105	CE04W1C471M	CE 470μF 16WV
E-1	C106	CK45B1H103K	CK 0.01μF ±10%
E-2	C107	CK45B1H103K	CK 0.01μF ±10%
	C108	No use	
F-1	C109	CE04W1C470M	CE 47μF 16WV
F-2	C110	CK45B1H103K	CK 0.01μF ±10%
F-1	C111	CK45B1H103K	CK 0.01μF ±10%
E-3	C112	CK45B1H103K	CK 0.01μF ±10%
	C113	No use	
	C114	No use	
	C115	CC45CH1H330J	CC 33pF ±5%
	C116	CC45CH1H080D	CC 8pF ±0.5pF
D-3	C117	CC45SL1H101J	CC 100pF ±5%
E-3	C118	CC45SL1H101J	CC 100pF ±5%
D-2	C119	CC45SL1H101J	CC 100pF ±5%
B-1	C120	CC45CH1H220J	CC 22pF ±5%
	C121	No use	
D-2	C122	CC45SL1H101J	CC 100pF ±5%
E-1	C123	CC45SL1H101J	CC 100pF ±5%
D-3	C124	CE04W1H010M	CE 1μF 50WV
D-2	C125	C90-0298-05	SCC 0.1μF 12WV
D-2	C126	CC45SL1H101J	CC 100pF ±5%
F-3	C127	C90-0298-05	SCC 0.1μF 12WV
D-2	C128	C90-0298-05	SCC 0.1μF 12WV
D-2	C129	C90-0298-05	SCC 0.1μF 12WV
F-1	C130	C90-0298-05	SCC 0.1μF 12WV
	C131	No use	
B-1	C132	CC45CH1H120J	CC 12pF ±5%
	C133	No use	
	C134	No use	
E-2	C135	CC45CH1H150J	CC 15pF ±5%
E-2	C136	CC45CH1H150J	CC 15pF ±5%
	C137	No use	
	C138	CC45CH1H150J	CC 15pF ±5%
	C139	No use	
D-3	C140	CC45CH1H030C	CC 3pF ±0.25pF
C-1	C141	CC45CH1H030C	CC 3pF ±0.25pF
D-2	C142	CK45B1H103K	CK 0.01μF ±10%
B-1	C143	CK45B1H103K	CK 0.01μF ±10%
	C144	No use	
	C145	No use	
D-3	C146	CC45CH1H030C	CC 3pF ±0.25pF
D-1	C147	CC45CH1H030C	CC 3pF ±0.25pF
	C148	No use	
	C149	No use	
A-3	C150	C90-0298-05	SCC 0.1μF 12WV
	C151	No use	
	C152	No use	
	C153	No use	
	C154	No use	
	C155	No use	
	C156	No use	
	C157	No use	
	C158	No use	
D-2	C159	CK45B1H103K	CK 0.01μF ±10%
E-2	C160	CC45CH1H050C	CC 5pF ±0.25pF
E-2	C161	CC45CH1H050C	CC 5pF ±0.25pF
A-1	C162	C90-0298-05	SCC 0.1μF 12WV
C-2	C163	CC45SL1H470J	CC 47pF ±5%
	C164	No use	

Fig. & Index No.	Ref. No.	Parts No.	Name & Description
	C165	No use	
	C166	No use	
D-3	C167	CC45CH1H150J	CC 15pF ±5%
C-2	C168	CC45CH1H150J	CC 15pF ±5%
D-2	C169	CC45CH1H150J	CC 15pF ±5%
E-3	C170	CC45CH1H150J	CC 15pF ±5%
C-2	C171	CC45CH1H150J	CC 15pF ±5%
E-1	C172	CC45CH1H150J	CC 15pF ±5%
	C173	No use	
C-1	C174	CC45CH1H030C	CC 3pF ±0.25pF
	C175	CC45CH1H050C	CC 5pF ±0.25pF
	C176	CC45CH1H050C	CC 5pF ±0.25pF
	C177	CC45CH1H050C	CC 5pF ±0.25pF
	C178	CC45CH1H101J	CC 100pF ±10%
	C179	CC45CH1H101J	CC 100pF ±10%
	C180	CC45CH1H101J	CC 100pF ±10%
	C181	CC45CH1H101J	CC 100pF ±10%
C-2	C182	CK45B1H103K	CK 0.01μF ±10%
C-3	C183	CC45CH1H101J	CC 100pF ±5%
	C184	No use	
	C185	No use	
	C186	No use	
	C187	No use	
	C188	No use	
	C189	No use	
C-2	C190	CC45CH1H030C	CC 3pF ±0.25pF
	C191	No use	
	C192	CC45CH1H030C	CC 3pF ±0.25pF
	C193	CC45CH1H030C	CC 3pF ±0.25pF
	C194	CC45CH1H030C	CC 3pF ±0.25pF
	C195	CC45CH1H030C	CC 3pF ±0.25pF
	C196	CC45CH1H030C	CC 3pF ±0.25pF
	C197	CC45CH1H030C	CC 3pF ±0.25pF
	C198	CC45CH1H030C	CC 3pF ±0.25pF
	C199	CC45CH1H030C	CC 3pF ±0.25pF
	C200	CC45CH1H030C	CC 3pF ±0.25pF
	C201	CC45CH1H030C	CC 3pF ±0.25pF
	C202	No use	
	C203	CC45CH1H030C	CC 3pF ±0.25pF
	C204	CC45CH1H030C	CC 3pF ±0.25pF
	C205	CC45CH1H030C	CC 3pF ±0.25pF
	C206	CC45CH1H030C	CC 3pF ±0.25pF
	C207	CC45CH1H030C	CC 3pF ±0.25pF
B-3	TC1	C05-0030-15	TC 20pF
B-3	TC2	C05-0030-15	TC 20pF
D-3	TC3	C05-0030-15	TC 20pF
D-3	TC4	C05-0030-15	TC 20pF
B-1	TC5	C05-0030-15	TC 20pF
C-3	TC6	C05-0030-15	TC 20pF
D-1	TC7	C05-0030-15	TC 20pF
D-1	TC8	C05-0030-15	TC 20pF
C-2	TC9	C05-0309-15	TC 40pF
C-3	TC10	C05-0030-15	TC 20pF
C-1	TC11	C05-0030-15	TC 20pF
B-3	L1	L40-2201-03	Ferri-inductor 22μH
B-3	L2	L40-2201-03	Ferri-inductor 22μH
C-2	L3	L40-2201-03	Ferri-inductor 22μH
	L4	No use	
	L5	No use	
D-3	L6	L40-2201-03	Ferri-inductor 22μH
B-1	L7	L40-2201-03	Ferri-inductor 22μH
C-2	L8	L40-2201-03	Ferri-inductor 22μH
C-1	L9	L40-2201-03	Ferri-inductor 22μH
	L10	No use	
D-1	L11	L40-2201-03	Ferri-inductor 22μH

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description
D-3	D1		Diode Silicon DS442X
D-1	D2		Diode Silicon DS442X
D-3	D3		Diode Silicon DS442X
D-1	D4		Diode Silicon DS442X
B-2	D5		Diode Silicon DS442X
B-2	D6		Diode Silicon DS442X
D-3	D7		Diode Silicon DS442X
D-3	D8		Diode Silicon DS442X
	D9	No use	
	D10	No use	
D-2	D11		Diode Zener WZ-071
D-2	D12		Diode Zener WZ-071
D-2	D13		Diode Silicon DS442X
E-2	D14		Diode Silicon DS442X
F-2	D15		Diode Silicon DS442X
E-2	D16		Diode Silicon DS442X
E-2	D17		Diode Silicon DS442X
E-2	D18		Diode Silicon DS442X
F-2	D19		Diode Silicon DS442X
E-2	D20		Diode Silicon DS442X
E-2	D21		Diode Silicon DS442X
E-2	D22		Diode Silicon DS442X
E-2	D23		Diode Silicon DS442X
E-2	D24		Diode Silicon DS442X
F-2	D25		Diode Silicon DS442X
F-2	D26		Diode Silicon DS442X
E-2	D27		Diode Silicon DS442X
F-2	D28		Diode Silicon DS442X
F-2	D29		Diode Silicon DS442X
C-3	D30		Diode Silicon DS442X
C-2	D31		Diode Silicon DS442X
E-3	D32		Diode Silicon DS442X
D-2	D33		Diode Silicon DS442X
C-2	D34		Diode Silicon DS442X
E-1	D35		Diode Silicon DS442X
C-3	D36		Diode Zener WZ-061
C-1	D37		Diode Zener WZ-061
	D38	No use	
	D39	No use	
B-3	D40		Diode Silicon 1S2686
B-3	D41		Diode Silicon 1S2686
B-1	D42		Diode Silicon 1S2686
B-1	D43		Diode Silicon 1S2686
A-2	D44		Diode Silicon DS442X
B-3	Q1		TR NPN 2SC536KNP (F)
B-3	Q2		TR NPN 2SC1215 (T or S)
B-2	Q3		TR NPN 2SC1215 (T or S)
C-3	Q4		TR PNP 2SA838 (C)
C-3	Q5		TR PNP 2SA838 (C)
C-3	Q6		TR PNP 2SA838 (C)
C-3	Q7		TR PNP 2SA838 (C)
B-2	Q8		TR PNP 2SA608KS)
C-2	Q9		TR PNP 2SA608KNP (F)
C-3	Q10		TR NPN 2SC1215 (T or S)
C-2	Q11		TR NPN 2SC1215 (T or S)
C-3	Q12		TR NPN 2SC1215 (T or S)
C-2	Q13		TR NPN 2SC1215 (T or S)
C-3	Q14		TR PNP 2SA838 (C)
D-3	Q15		TR NPN 2SC2671
C-2	Q16		TR PNP 2SA838 (C)
C-2	Q17		TR NPN 2SC2671
D-3	Q18		TR NPN 2SC536KNP (F)
D-3	Q19		TR NPN 2SC536KNP (F)
D-2	Q20		TR NPN 2SC536KNP (F)

Fig. & Index No.	Ref. No.	Parts No.	Name & Description
D-2	Q21		TR NPN 2SC536KNP (F)
	Q22	No use	
D-3	Q23		TR NPN 2SC536KNP (F)
D-3	Q24		TR NPN 2SC536KNP (F)
D-3	Q25		TR NPN 2SC536KNP (F)
D-3	Q26		TR NPN 2SC536KNP (F)
E-3	Q27		TR NPN 2SC536KNP (F)
E-3	Q28		TR NPN 2SC1215 (T or S)
E-3	Q29		TR PNP 2SA838 (C)
E-3	Q30		TR NPN 2SC2671
D-3	Q31		TR NPN 2SC1215 (T or S)
D-3	Q32		TR NPN 2SC1215 (T or S)
D-2	Q33		TR PNP 2SA608KNP (F)
D-2	Q34		TR NPN 2SC536KNP (F)
E-2	Q35		TR NPN 2SC1047 (C)
E-2	Q36		TR NPN 2SC1047 (C)
D-2	Q37		TR PNP 2SA608KNP (F)
E-2	Q38		TR NPN 2SC1215 (T or S)
E-2	Q39		TR NPN 2SC1215 (T or S)
D-2	Q40		TR PNP 2SA838 (C)
D-2	Q41		TR NPN 2SC2671
E-2	Q42		TR NPN 2SC1215 (T or S)
E-2	Q43		TR NPN 2SC1215 (T or S)
E-2	Q44		TR PNP 2SA1161
E-2	Q45		TR PNP 2SA1161
B-2	Q46		TR NPN 2SC536KNP (F)
B-2	Q47		TR NPN 2SC536KNP (F)
B-2	Q48		TR NPN 2SC536KNP (F)
B-2	Q49		TR NPN 2SC536KNP (F)
B-1	Q50		TR NPN 2SC1215 (T or S)
B-1	Q51		TR NPN 2SC1215 (T or S)
C-2	Q52		TR PNP 2SA838 (C)
C-1	Q53		TR PNP 2SA838 (C)
C-2	Q54		TR PNP 2SA838 (C)
C-1	Q55		TR PNP 2SA838 (C)
C-2	Q56		TR PNP 2SA608KNP (F)
C-2	Q57		TR PNP 2SA608KNP (F)
C-2	Q58		TR NPN 2SC1215 (T or S)
C-1	Q59		TR NPN 2SC1215 (T or S)
C-1	Q60		TR NPN 2SC1215 (T or S)
C-1	Q61		TR NPN 2SC1215 (T or S)
C-2	Q62		TR PNP 2SA838 (C)
C-2	Q63		TR NPN 2SC2671
D-1	Q64		TR NPN 2SC536KNP (F)
D-2	Q65		TR NPN 2SC536KNP (F)
D-1	Q66		TR NPN 2SC536KNP (F)
D-1	Q67		TR NPN 2SC536KNP (F)
D-1	Q68		TR NPN 2SC536KNP (F)
D-1	Q69		TR NPN 2SC536KNP (F)
D-1	Q70		TR NPN 2SC536KNP (F)
D-1	Q71		TR NPN 2SC536KNP (F)
E-1	Q72		TR NPN 2SC536KNP (F)
E-1	Q73		TR NPN 2SC536KNP (F)
E-1	Q74		TR PNP 2SA838 (C)
E-1	Q75		TR PNP 2SA2671
D-1	Q76		TR NPN 2SC1215 (T or S)
D-1	Q77		TR NPN 2SC1215 (T or S)
E-2	Q78		TR NPN 2SC536KNP (F)
A-2	Q79		TR NPN 2SC536KNP (F)
B-3	IC1		IC Linear CA3102E
B-1	IC2		IC Linear CA3102E
E-3	IC3		IC Digital SN74LS32N
E-2	IC4		IC Digital SN74LS11N
E-2	IC5		IC Digital SN74LS112AN

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description		
E-1	IC6		IC	Digital	SN74LS08N
E-1	IC7		IC	Digital	SN74LS00N
A-2	TH1		Thermistor		SDT-1000
A-3	P3	E40-0618-05	Pin connector		6P
A-1	P4	E40-0618-05	Pin connector		6P
F-2	P5	E40-1276-05	Pin connector		12P
	P6	No use			
B-2	P7	E40-0576-05	Pin connector		5P
C-2	P8	E40-0576-05	Pin connector		5P
E-2	P9	E40-0376-05	Pin connector		3P
	P10	No use			
E-1	P11	E40-0476-05	Pin connector		4P
E-1	P12	E40-0476-05	Pin connector		4P
	P13	No use			
F-2	P14	E40-0776-05	Pin connector		7P
D-3	P15	E40-0276-05	Pin connector		2P
D-2	P16	E40-0276-05	Pin connector		2P
F-3	P17	E40-0276-05	Pin connector		2P
F-1	P18	E40-0276-05	Pin connector		2P
D-1	P19	E40-0276-05	Pin connector		2P
F-1	P20	E40-0576-05	Pin connector		5P
D-2	P21	E40-0276-05	Pin connector		2P
D-2	TP	E40-0211-05	Pin connector		2P
		L92-0110-05	Core (beads type)		

VERTICAL OUTPUT AMPLIFIER UNIT X73-1330-01

Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
E-3	R1	RN14BK2B91R0F	RN	91Ω	±1%	1/8W
E-3	R2	RN14BK2B91R0F	RN	91Ω	±1%	1/8W
E-2	R3	RD14BB2C220J	RD	22Ω		
E-3	R4	RD14BB2C220J	RD	22Ω		
D-2	R5	RD14BB2C100J	RD	10Ω		
	R6	No use				
E-2	R7	RD14BB2C332J	RD	3.3kΩ		
E-2	R8	RN14BK2B27R0F	RN	27Ω	±1%	1/8W
D-2	R9	RN14BK2B27R0F	RN	27Ω	±1%	1/8W
D-2	R10	RD14BB2C220J	RD	22Ω		
D-3	R11	RD14BB2C220J	RD	22Ω		
D-3	R12	RD14BB2C302J	RD	3kΩ		
D-2	R13	RD14BB2C122J	RD	1.2kΩ		
D-2	R14	RD14BB2C220J	RD	22Ω		
D-3	R15	RD14BB2C220J	RD	22Ω		
D-2	R16	RN14BK2E6200F	RN	620Ω	±1%	1/4W
D-3	R17	RN14BK2E6200F	RN	620Ω	±1%	1/4W
C-2	R18	RD14BB2C220J	RD	22Ω		
C-3	R19	RD14BB2C220J	RD	22Ω		
D-3	R20	RD14BB2C470J	RD	47Ω		
D-3	R21	RD14BB2C220J	RD	22Ω		
D-3	R22	RD14BB2C220J	RD	22Ω		
	R23	No use				
	R24	No use				
C-2	R25	RD14BB2C102J	RD	1kΩ		
C-3	R26	RD14BB2C822J	RD	8.2kΩ		
C-2	R27	RD14BB2E560J	RD	56Ω	±5%	1/4W
C-3	R28	RD14BB2E560J	RD	56Ω	±5%	1/4W
C-3	R29	RS14AB3D820J	RS	82Ω	±5%	2W
C-2	R30	RD14BB2C100J	RD	10Ω		
C-3	R31	RD14BB2C100J	RD	10Ω		
C-2	R32	RD14BB2C220J	RD	22Ω		
C-3	R33	RD14BB2C220J	RD	22Ω		
B-2	R34	RD14BB2C471J	RD	470Ω		
B-2	R35	RD14BB2C471J	RD	470Ω		
	R36	No use				
B-3	R37	RD14BB2C471J	RD	470Ω		
B-3	R38	RD14BB2C471J	RD	470Ω		
	R39	No use				
B-2	R40	RS14AB3D151J	RS	150Ω	±5%	2W
B-2	R41	RS14AB3D151J	RS	150Ω	±5%	2W
	R42	No use				
E-3	R43	RN14BK2B5601F	RN	5.6kΩ	±1%	1/8W
D-3	R44	RN14BK2B4301F	RN	4.3kΩ	±1%	1/8W
D-3	R45	RN14BK2B1500F	RN	150Ω	±1%	1/8W
B-3	R46	RS14AB3D151J	RS	150Ω	±5%	2W
B-3	R47	RS14AB3D151J	RS	150Ω	±5%	2W
	R48	No use				
E-2	R49	RN14BK2B4700F	RN	470Ω	±1%	1/8W
D-3	R50	RD14BB2C101J	RD	100Ω		
	R51	No use				
	R52	No use				
	R53	No use				
D-2	R54	RD14BB2C332J	RD	3.3kΩ		
D-3	VR1	R12-0541-05	VR	100Ω		
E-3	C1	CK45B1H103K	CK	0.01μF	±10%	
	C2	No use				
D-3	C3	CE04W0J102M	CE	1000μF		6.3WV
C-3	C4	CK45B1H103K	CK	0.01μF	±10%	
D-2	C5	CK45B1H103K	CK	0.01μF	±10%	
D-3	C6	CK45B1H103K	CK	0.01μF	±10%	
C-2	C7	CK45B1H103K	CK	0.01μF	±10%	
C-2	C8	CK45B1H103K	CK	0.01μF	±10%	

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
C-3	C9	CK45B2H472K	CK	4700pF	±10%	500WV
E-2	C10	CK45B1H103K	CK	0.01μF	±10%	
E-3	C11	CK45B1H103K	CK	0.01μF	±10%	
D-2	C12	CE04W1J330M	CE	33μF		63WV
C-2	C13	CK45B2H472K	CK	4700pF	±10%	500WV
F-3	C14	CE04W1V470M	CE	47μF		35WV
F-3	C15	CK45B1H103K	CK	0.01μF	±10%	
E-3	C16	CE04W1C470M	CE	47μF		16WV
E-3	C17	CK45B1H103K	CK	0.01μF	±10%	
C-2	C18	CC45CH1H070D	CC	7pF	±0.5pF	
C-3	C19	CK45B1H152K	CK	1500pF	±10%	
E-2	C20	CC45CH1H100D	CC	10pF	±0.5pF	
E-2	C21	CE04W1C331M	CE	330μF		16WV
D-2	TC1	C05-0411-05	TC	10pF		
	TC2	No use				
C-2	TC3	C05-0414-15	TC	40pF		
B-2	L1	L40-2282-13	Ferri-inductor		0.22μH	
A-2	L2	L40-2282-13	Ferri-inductor		0.22μH	
	L3	No use				
B-3	L4	L40-2282-13	Ferri-inductor		0.22μH	
A-3	L5	L40-2282-13	Ferri-inductor		0.22μH	
	L6	No use				
D-2	L7	L40-1011-03	Ferri-inductor		100μH	
E-2	L8	L40-1011-03	Ferri-inductor		100μH	
F-2	L9	L40-1011-03	Ferri-inductor		100μH	
E-2	Q1		TR	NPN	2SC2499	
E-3	Q2		TR	NPN	2SC2499	
D-2	Q3		TR	NPN	2SC2499	
D-3	Q4		TR	NPN	2SC2499	
D-3	Q5		TR	NPN	2SC1047 (C)	
	Q6	No use				
C-2	Q7		TR	NPN	2SC2644	
C-3	Q8		TR	NPN	2SC2644	
C-2	Q9		TR	NPN	2SC1164 (O)	
C-3	Q10		TR	NPN	2SC1164 (O)	
D-3	Q11		TR	NPN	2SC536KNP (F)	
E-3	Q12		TR	NPN	2SC536KNP (F)	
C-2	Q13		TR	NPN	2SC2644	
C-3	Q14		TR	NPN	2SC2644	
F-2	P10	E40-0377-05	Pin connector		3P	
F-3	P13	E40-0277-05	Pin connector		2P	
E-2	P20	E40-0576-05	Pin connector		5P	
E-2	P22	E40-0776-05	Pin connector		7P	
		E23-0512-05	Terminal			
		F02-0502-05	Heat sink			
		L92-0110-05	Core (beads type)			

SWEEP ROTARY UNIT X74-1310-01

Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
C-2	R1	RN14BK2B3603F	RN	360kΩ	±1%	1/8W
C-2	R2	RN14BK2B1203F	RN	120kΩ	±1%	1/8W
C-2	R3	RN14BK2B3002F	RN	30kΩ	±1%	1/8W
C-2	R4	RN14BK2B3002F	RN	30kΩ	±1%	1/8W
C-2	R5	RN14BK2B3602F	RN	36kΩ	±1%	1/8W
D-2	R6	RN14BK2B1202F	RN	12kΩ	±1%	1/8W
D-2	R7	RN14BK2B3001F	RN	3kΩ	±1%	1/8W
D-2	R8	RN14BK2B3001F	RN	3kΩ	±1%	1/8W
D-2	R9	RN14BK2B3601F	RN	3.6kΩ	±1%	1/8W
C-2	R10	RD14BB2C124J	RD	120kΩ		
C-2	R11	RD14BB2C393J	RD	39kΩ		
C-2	R12	RD14BB2C203J	RD	20kΩ		
C-2	R13	RD14BB2C123J	RD	12kΩ		
D-2	R14	RD14BB2C392J	RD	3.9kΩ		
D-2	R15	RD14BB2C202J	RD	2kΩ		
D-2	R16	RD14BB2C202J	RD	2kΩ		
D-2	R17	RD14BB2C103J	RD	10kΩ		
C-1	R18	RD14BB2C103J	RD	10kΩ		
C-2	R19	RD14BB2C103J	RD	10kΩ		
C-3	R20	RN14BK2B3603F	RN	360kΩ	±1%	1/8W
C-3	R21	RN14BK2B1203F	RN	120kΩ	±1%	1/8W
C-3	R22	RN14BK2B3002F	RN	30kΩ	±1%	1/8W
C-3	R23	RN14BK2B3002F	RN	30kΩ	±1%	1/8W
C-3	R24	RN14BK2B3602F	RN	36kΩ	±1%	1/8W
D-3	R25	RN14BK2B1202F	RN	12kΩ	±1%	1/8W
D-3	R26	RN14BK2B3001F	RN	3kΩ	±1%	1/8W
D-3	R27	RN14BK2B3001F	RN	3kΩ	±1%	1/8W
D-3	R28	RN14BK2B3601F	RN	3.6kΩ	±1%	1/8W
C-3	R29	RD14BB2C124J	RD	120kΩ		
C-3	R30	RD14BB2C393J	RD	39kΩ		
C-3	R31	RD14BB2C203J	RD	20kΩ		
C-3	R32	RD14BB2C123J	RD	12kΩ		
D-3	R33	RD14BB2C392J	RD	3.9kΩ		
D-3	R34	RD14BB2C202J	RD	2kΩ		
D-3	R35	RD14BB2C202J	RD	2kΩ		
D-2	R36	RD14BB2C103J	RD	10kΩ		
C-2	R37	RD14BB2C103J	RD	10kΩ		
C-3	R38	RD14BB2C103J	RD	10kΩ		
C-2	C1	CK45B1H103K	CK	0.01μF	±10%	
C-2	C2	CK45B1H103K	CK	0.01μF	±10%	
C-2	C3	CK45B1H103K	CK	0.01μF	±10%	
C-4	C4	CK45B1H103K	CK	0.01μF	±10%	
C-2	D1		Diode	Silicon	GMA-01	
C-2	D2		Diode	Silicon	GMA-01	
C-2	D3		Diode	Silicon	GMA-01	
C-2	D4		Diode	Silicon	GMA-01	
D-2	D5		Diode	Silicon	GMA-01	
D-2	D6		Diode	Silicon	GMA-01	
D-2	D7		Diode	Silicon	GMA-01	
	D8	No use				
C-3	D9		Diode	Silicon	GMA-01	
C-3	D10		Diode	Silicon	GMA-01	
C-3	D11		Diode	Silicon	GMA-01	
C-3	D12		Diode	Silicon	GMA-01	
D-3	D13		Diode	Silicon	GMA-01	
D-3	D14		Diode	Silicon	GMA-01	
D-3	D15		Diode	Silicon	GMA-01	
B-3	P15-19	E40-0976-05	Pin connector		9P	
		E40-1076-05	Pin connector		10P	
B-2	P40	E40-0876-05	Pin connector		8P	
B-2	P41	E40-0876-05	Pin connector		8P	

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description
C-3	P51	E40-0776-05	Pin connector 7P
B-3	P57	E40-0376-05	Pin connector 3P
		E40-2336-05	Parallel cable

SWEEP UNIT X74-1320-01

Fig. & Index No.	Ref. No.	Parts No.	Name & Description
	R1	No use	
	R2	No use	
	R3	No use	
	R4	No use	
	R5	RD14BB2C181J	RD 180Ω
	R6	RD14BB2C332J	RD 3.3kΩ
	R7	RD14BB2C332J	RD 3.3kΩ
A-1	R8	RD14BB2C222J	RD 2.2kΩ
B-1	R9	RD14BB2C470J	RD 47Ω
B-1	R10	RD14BB2C681J	RD 680Ω
B-1	R11	RD14BB2C511J	RD 510Ω
B-2	R12	RD14BB2C511J	RD 510Ω
D-2	R13	RD14BB2C511J	RD 510Ω
B-1	R14	RD14BB2C182J	RD 1.8kΩ
B-2	R15	RD14BB2C681J	RD 680Ω
B-2	R16	RD14BB2C182J	RD 1.8kΩ
B-2	R17	RD14BB2C681J	RD 680Ω
B-1	R18	RD14BB2C511J	RD 510Ω
B-2	R19	RD14BB2C181J	RD 180Ω
B-2	R20	RD14BB2C181J	RD 180Ω
B-2	R21	RD14BB2C181J	RD 180Ω
B-2	R22	RD14BB2C332J	RD 3.3kΩ
B-2	R23	RD14BB2C152J	RD 1.5kΩ
B-1	R24	RD14BB2C511J	RD 510Ω
C-1	R25	RD14BB2C271J	RD 270Ω
	R26	RD14BB2C472J	RD 4.7kΩ
C-1	R27	RD14BB2C101J	RD 100Ω
C-1	R28	RD14BB2C103J	RD 10kΩ
C-1	R29	RD14BB2C271J	RD 270Ω
C-1	R30	RD14BB2C511J	RD 510Ω
D-1	R31	RD14BB2C361J	RD 360Ω
D-1	R32	RD14BB2C152J	RD 1.5kΩ
C-2	R33	RD14BB2C511J	RD 510Ω
	R34	No use	
	R35	No use	
	R36	No use	
	R37	No use	
	R38	No use	
	R39	No use	
C-1	R40	RD14BB2C511J	RD 510Ω
D-1	R41	RD14BB2C361J	RD 360Ω
D-1	R42	RD14BB2C220J	RD 22Ω
D-2	R43	RN14BK2B2401F	RN 2.4kΩ ±1% 1/8W
D-2	R44	RN14BK2B5101F	RN 5.1kΩ ±1% 1/8W
	R45	No use	
	R46	No use	
D-1	R47	RN14BK2B2401F	RN 2.4kΩ ±1% 1/8W
E-1	R48	RD14BB2C123J	RD 12kΩ
E-1	R49	RN14BK2B1502F	RN 15kΩ ±1% 1/8W
E-1	R50	RN14BK2B1202F	RN 12kΩ ±1% 1/8W
E-2	R51	RN14BK2B1002F	RN 10kΩ ±1% 1/8W
E-1	R52	RN14BK2B4302F	RN 43kΩ ±1% 1/8W
E-1	R53	RD14BB2C103J	RD 10kΩ
E-1	R54	RD14BB2C103J	RD 10kΩ
E-2	R55	RN14BK2B3901F	RN 3.9kΩ ±1% 1/8W
E-1	R56	RN14BK2B3901F	RN 3.9kΩ ±1% 1/8W
E-1	R57	RD14BB2C103J	RD 10kΩ
E-2	R58	RD14BB2C104J	RD 100kΩ
E-2	R59	RD14BB2C103J	RD 10kΩ
D-2	R60	RD14BB2C103J	RD 10kΩ
E-2	R61	RD14BB2C104J	RD 100kΩ
D-2	R62	RD14BB2C103J	RD 10kΩ
E-2	R63	RD14BB2C103J	RD 10kΩ
D-2	R64	RD14BB2C104J	RD 100kΩ
D-2	R65	RD14BB2C103J	RD 10kΩ

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
E-2	R66	RD14BB2C103J	RD	10Ω		
D-2	R67	RD14BB2C470J	RD	47Ω		
D-2	R68	RD14BB2C101J	RD	100Ω		
D-2	R69	RD14BB2C101J	RD	100Ω		
D-2	R70	RD14BB2C470J	RD	47Ω		
D-2	R71	RD14BB2C470J	RD	47Ω		
D-2	R72	RD14BB2C101J	RD	100Ω		
D-2	R73	RD14BB2C101J	RD	100Ω		
C-2	R74	RD14BB2C242J	RD	2.4kΩ		
D-2	R75	RD14BB2C101J	RD	100Ω		
	R76	No use				
D-2	R77	RD14BB2C393J	RD	39kΩ		
D-2	R78	RD14BB2C152J	RD	1.5kΩ		
C-2	R79	RD14BB2C102J	RD	1kΩ		
C-2	R80	RD14BB2C101J	RD	100Ω		
C-1	R81	RD14BB2C511J	RD	510Ω		
C-1	R82	RD14BB2C511J	RD	510Ω		
C-2	R83	RD14BB2C331J	RD	330Ω		
B-1	R84	RD14BB2C511J	RD	510Ω		
C-2	R85	RD14BB2C222J	RD	2.2kΩ		
D-1	R86	RD14BB2C100J	RD	10Ω		
C-2	R87	RD14BB2C222J	RD	2.2kΩ		
C-2	R88	RD14BB2C273J	RD	27kΩ		
C-2	R89	RD14BB2C472J	RD	4.7kΩ		
C-2	R90	RD14BB2C102J	RD	1kΩ		
C-2	R91	RD14BB2C472J	RD	4.7kΩ		
C-2	R92	RD14BB2C302J	RD	3kΩ		
C-2	R93	RD14BB2C102J	RD	1kΩ		
C-2	R94	RD14BB2C122J	RD	1.2kΩ		
C-1	R95	RD14BB2C182J	RD	1.8kΩ		
C-1	R96	RD14BB2C152J	RD	1.5kΩ		
C-1	R97	RD14BB2C511J	RD	510Ω		
C-2	R98	RN14BK2B5100F	RN	510Ω	±1%	1/8W
C-2	R99	RD14BB2C221J	RD	220Ω		
	R100	No use				
C-2	R101	RN14BK2B4701F	RN	4.7kΩ	±1%	1/8W
C-2	R102	RN14BK2B4701F	RN	4.7kΩ	±1%	1/8W
C-2	R103	RD14BB2C101J	RD	100Ω		
C-2	R104	RD14BB2C511J	RD	510Ω		
C-3	R105	RD14BB2C511J	RD	510Ω		
C-3	R106	RD14BB2C162J	RD	1.6kΩ		
C-3	R107	RD14BB2C222J	RD	2.2kΩ		
	R108	No use				
C-1	R109	RD14BB2C102J	RD	1kΩ		
D-4	R110	RD14BB2C103J	RD	10kΩ		
	R111	No use				
	R112	No use				
C-1	R113	RD14BB2C222J	RD	2.2kΩ		
C-4	R114	RD14BB2C222J	RD	2.2kΩ		
A-3	R115	RD14BB2C222J	RD	2.2kΩ		
B-4	R116	RD14BB2C681J	RD	680Ω		
	R117	RD14BB2C511J	RD	510Ω		
B-4	R118	RD14BB2C470J	RD	47Ω		
B-4	R119	RD14BB2C511J	RD	510Ω		
B-4	R120	RD14BB2C511J	RD	510Ω		
B-4	R121	RD14BB2C511J	RD	510Ω		
B-4	R122	RD14BB2C182J	RD	1.8kΩ		
B-4	R123	RD14BB2C681J	RD	680Ω		
B-4	R124	RD14BB2C182J	RD	1.8kΩ		
B-4	R125	RD14BB2C681J	RD	680Ω		
B-4	R126	RD14BB2C511J	RD	510Ω		
A-4	R127	RD14BB2C181J	RD	180Ω		
B-4	R128	RD14BB2C181J	RD	180Ω		
B-3	R129	RD14BB2C181J	RD	180Ω		
A-4	R130	RD14BB2C152J	RD	1.5kΩ		

Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
A-4	R131	RD14BB2C332J	RD	3.3kΩ		
B-4	R132	RD14BB2C511J	RD	510Ω		
	R133	No use				
C-4	R134	RD14BB2C101J	RD	100Ω		
C-4	R135	RD14BB2C271J	RD	270Ω		
C-4	R136	RD14BB2C102J	RD	1kΩ		
C-4	R137	RD14BB2C271J	RD	270Ω		
C-4	R138	RD14BB2C511J	RD	510Ω		
D-4	R139	RD14BB2C361J	RD	360Ω		
D-4	R140	RD14BB2C152J	RD	1.5kΩ		
	R141	No use				
C-4	R142	RD14BB2C511J	RD	510Ω		
D-4	R143	RD14BB2C361J	RD	360Ω		
D-3	R144	RN14BK2B5101F	RN	5.1kΩ	±1%	1/8W
D-3	R145	RN14BK2B7501F	RN	7.5kΩ	±1%	1/8W
B-4	R146	RD14BB2C511J	RD	510Ω		
D-4	R147	RN14BK2B2401F	RN	2.4kΩ	±1%	1/8W
E-4	R148	RD14BB2C123J	RD	12kΩ		
E-4	R149	RN14BK2B1502F	RN	15kΩ	±1%	1/8W
E-4	R150	RN14BK2B1202F	RN	12kΩ	±1%	1/8W
E-4	R151	RN14BK2B4302F	RN	43kΩ	±1%	1/8W
E-4	R152	RN14BK2B1002F	RN	10kΩ	±1%	1/8W
E-4	R153	RD14BB2C103J	RD	10kΩ		
E-4	R154	RN14BK2B3901F	RN	3.9kΩ	±1%	1/8W
E-4	R155	RN14BK2B3901F	RN	3.9kΩ	±1%	1/8W
E-4	R156	RD14BB2C103J	RD	10kΩ		
E-3	R157	RD14BB2C104J	RD	100kΩ		
	R158	No use				
E-3	R159	RD14BB2C103J	RD	10kΩ		
E-3	R160	RD14BB2C104J	RD	100kΩ		
	R161	No use				
E-3	R162	RD14BB2C103J	RD	10kΩ		
D-3	R163	RD14BB2C104J	RD	100kΩ		
	R164	No use				
E-3	R165	RD14BB2C103J	RD	10kΩ		
D-4	R166	RD14BB2C470J	RD	47Ω		
D-3	R167	RD14BB2C101J	RD	100Ω		
D-3	R168	RD14BB2C101J	RD	100Ω		
D-3	R169	RD14BB2C470J	RD	47Ω		
C-3	R170	RD14BB2C472J	RD	4.7kΩ		
C-4	R171	RD14BB2C122J	RD	1.2kΩ		
C-4	R172	RD14BB2C182J	RD	1.8kΩ		
C-4	R173	RD14BB2C152J	RD	1.5kΩ		
C-4	R174	RD14BB2C511J	RD	510Ω		
	R175	No use				
	R176	No use				
	R177	No use				
	R178	No use				
	R179	No use				
	R180	No use				
	R181	No use				
	R182	No use				
	R183	No use				
B-4	R184	RD14BB2C511J	RD	510Ω		
	R185	No use				
C-4	R186	RD14BB2C511J	RD	510Ω		
	R187	No use				
C-4	R188	RD14BB2C362J	RD	3.6kΩ		
	R189	RD14BB2C102J	RD	1kΩ		
C-3	R190	RD14BB2C162J	RD	1.6kΩ		
C-3	R191	RD14BB2C362J	RD	3.6kΩ		
	R192	No use				
E-4	R193	RD14BB2C103J	RD	10kΩ		
D-4	R194	RD14BB2C220J	RD	22Ω		
D-4	R195	RD14BB2C100J	RD	10Ω		

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
F-3	R196	RD14BB2C470J	RD	47Ω		
F-3	R197	RD14BB2C470J	RD	47Ω		
F-2	R198	RN14BK2B4701F	RN	4.7kΩ	±1%	1/8W
F-2	R199	RD14BB2C472J	RD	4.7kΩ		
E-3	R200	RN14BK2B3301F	RN	3.3kΩ	±1%	1/8W
E-3	R201	RN14BK2B1201F	RN	1.2kΩ	±1%	1/8W
E-2	R202	RD14BB2C392J	RD	3.9kΩ		
E-3	R203	RD14BB2C102J	RD	1kΩ		
E-2	R204	RD14BB2C132J	RD	1.3kΩ		
E-2	R205	RD14BB2C470J	RD	47Ω		
	R206	RN14BK2B3301F	RN	3.3kΩ	±1%	1/8W
F-2	R207	RN14BK2B6201F	RN	6.2kΩ	±1%	1/8W
E-2	R208	RD14BB2C472J	RD	4.7kΩ		
F-2	R209	RD14BB2C472J	RD	4.7kΩ		
E-2	R210	RN14BK2B4700F	RN	470Ω	±1%	1/8W
F-2	R211	RN14BK2B4700F	RN	470Ω	±1%	1/8W
E-2	R212	RN14BK2B2201F	RN	2.2kΩ	±1%	1/8W
E-2	R213	RD14BB2C621J	RD	620Ω		
F-2	R214	RN14BK2B2201F	RN	2.2kΩ	±1%	1/8W
E-2	R215	RN14BK2B1601F	RN	1.6kΩ	±1%	1/8W
F-2	R216	RN14BK2B1601F	RN	1.6kΩ	±1%	1/8W
F-2	R217	RD14BB2C470J	RD	47Ω		
F-2	R218	RD14BB2C470J	RD	47Ω		
E-1	R219	RN14BK2B1001F	RN	1kΩ	±1%	1/8W
E-2	R220	RN14BK2B1001F	RN	1kΩ	±1%	1/8W
E-2	R221	RN14BK2B1500F	RN	150Ω	±1%	1/8W
E-1	R222	RN14BK2B1001F	RN	1kΩ	±1%	1/8W
E-2	R223	RN14BK2B1001F	RN	1kΩ	±1%	1/8W
E-3	R224	RN14BK2B4701F	RN	4.7kΩ	±1%	1/8W
E-3	R225	RN14BK2B2001F	RN	2kΩ	±1%	1/8W
F-1	R226	RD14BB2C102J	RD	1kΩ		
F-2	R227	RD14BB2C102J	RD	1kΩ		
F-1	R228	RD14BB2C472J	RD	47kΩ		
F-2	R229	RD14BB2C470J	RD	47kΩ		
F-2	R230	RD14BB2C470J	RD	47kΩ		
F-2	R231	RD14BB2C470J	RD	47kΩ		
E-2	R232	RD14BB2C472J	RD	4.7kΩ		
E-2	R233	RD14BB2C103J	RD	10kΩ		
E-2	R234	RD14BB2C472J	RD	4.7kΩ		
E-2	R235	RD14BB2C103J	RD	10kΩ		
F-3	R236	RD14BB2C470J	RD	47Ω		
F-3	R237	RN14BK2B4701F	RN	4.7kΩ	±1%	1/8W
F-3	R238	RD14BB2C472J	RD	4.7kΩ		
E-3	R239	RN14BK2B1201F	RN	1.2kΩ	±1%	1/8W
E-3	R240	RN14BK2B3301F	RN	3.3kΩ	±1%	1/8W
E-3	R241	RN14BK2B2201F	RN	2.2kΩ	±1%	1/8W
C-3	R242	RN14BK2B6801F	RN	6.8kΩ	±1%	1/8W
C-2	R243	RN14BK2B6801F	RN	6.8kΩ	±1%	1/8W
F-3	R244	RD14BB2C223J	RD	22kΩ		
F-3	R245	RD14BB2C102J	RD	1kΩ		
F-3	R246	RD14BB2C122J	RD	1.2kΩ		
F-3	R247	RD14BB2C751J	RD	750Ω		
F-3	R248	RD14BB2C472J	RD	4.7kΩ		
B-2	R249	RD14BB2C511J	RD	510Ω		
B-2	R250	RD14BB2C511J	RD	510Ω		
B-2	R251	RD14BB2C471J	RD	470Ω		
A-2	R252	RD14BB2C101J	RD	100Ω		
A-2	R253	RD14BB2C331J	RD	330Ω		
A-2	R254	RD14BB2C220J	RD	22Ω		
A-2	R255	RD14BB2C272J	RD	2.7kΩ		
A-2	R256	RD14BB2C470J	RD	47Ω		
C-3	R257	RD14BB2C2R7J	RD	2.7Ω		
	R258	No use				
B-2	R259	RD14BB2C511J	RD	510Ω		
B-2	R260	RD14BB2C511J	RD	510Ω		

Fig. & Index No.	Ref. No.	Parts No.	Name & Description	
B-2	R261	RD14BB2C471J	RD	470Ω
A-2	R262	RD14BB2C101J	RD	100Ω
	R263	RD14BB2C331J	RD	330Ω
A-2	R264	RD14BB2C220J	RD	22Ω
A-2	R265	RD14BB2C272J	RD	2.7kΩ
A-2	R266	RD14BB2C470J	RD	47Ω
B-2	R267	RD14BB2C911J	RD	910Ω
B-2	R268	RD14BB2C432J	RD	4.3kΩ
B-3	R269	RD14BB2C202J	RD	2kΩ
B-3	R270	RD14BB2C102J	RD	1kΩ
B-3	R271	RD14BB2C102J	RD	1kΩ
B-3	R272	RD14BB2C202J	RD	2kΩ
B-2	R273	RD14BB2C222J	RD	2.2kΩ
B-2	R274	RD14BB2C222J	RD	2.2kΩ
B-2	R275	RD14BB2C511J	RD	510Ω
B-2	R276	RD14BB2C511J	RD	510Ω
	R277	RD14BB2C561J	RD	560Ω
	R278	No use		
	R279	No use		
B-2	R280	RD14BB2C511J	RD	510Ω
	R281	No use		
	R282	No use		
	R283	No use		
	R284	RD14BB2C472J	RD	4.7kΩ
C-2	R285	RD14BB2C222J	RD	2.2kΩ
B-3	R286	RD14BB2C511J	RD	510Ω
B-2	R287	RD14BB2C220J	RD	22Ω
A-2	R288	RD14BB2C101J	RD	100Ω
A-3	R289	RD14BB2C331J	RD	330Ω
C-2	R290	RD14BB2C152J	RD	1.5kΩ
A-4	R291	RD14BB2C222J	RD	2.2kΩ
	R292	RD14BB2C472J	RD	4.7kΩ
B-3	R293	RD14BB2C222J	RD	2.2kΩ
C-3	R294	RD14BB2C511J	RD	510Ω
C-3	R295	RD14BB2C220J	RD	22Ω
C-3	R296	RD14BB2C101J	RD	100Ω
C-3	R297	RD14BB2C331J	RD	330Ω
C-3	R298	RD14BB2C220J	RD	22Ω
C-3	R299	RD14BB2C121J	RD	120Ω
E-2	R300	RD14BB2C102J	RD	1kΩ
	R301	No use		
E-3	R302	RD14BB2C101J	RD	100Ω
	R303	No use		
	R304	No use		
E-2	R305	RD14BB2C331J	RD	330Ω
E-3	R306	RD14BB2C101J	RD	100Ω
E-3	R307	RD14BB2C220J	RD	22Ω
E-3	R308	RD14BB2C220J	RD	22Ω
E-3	R309	RD14BB2C331J	RD	330Ω
	R310	No use		
D-2	R311	RD14BB2C222J	RD	2.2kΩ
	R312	No use		
	R313	No use		
	R314	No use		
B-3	R315	RD14BB2C222J	RD	2.2kΩ
A-4	R316	RD14BB2C202J	RD	2kΩ
A-3	R317	RD14BB2C202J	RD	2kΩ
B-3	R318	RD14BB2C222J	RD	2.2kΩ
E-1	VR1	R12-3521-05	VR	20kΩ
E-1	VR2	R12-3521-05	VR	20kΩ
E-4	VR3	R12-3521-05	VR	20kΩ
E-4	VR4	R12-3521-05	VR	20kΩ
C-2	VR5	R12-2512-05	VR	5kΩ

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
C-2	VR6	R12-0539-05	VR	200Ω		
C-2	VR7	R12-1517-05	VR	1kΩ		
C-4	VR8	R12-1517-05	VR	1kΩ		
F-2	VR9	R12-2512-05	VR	5kΩ		
F-3	VR10	R12-2512-05	VR	5kΩ		
F-3	VR11	R12-1518-05	VR	2kΩ		
F-3	VR12	R12-1518-05	VR	2kΩ		
E-1	VR13	R12-0421-05	VR	100Ω		
E-2	VR14	R12-0539-05	VR	200Ω		
F-3	VR15	R12-2512-05	VR	5kΩ		
	C1	No use				
	C2	CE04W1C472M	CE	4700µF		16WV
C-3	C3	CC45SL1H101J	CC	100pF	±5%	
C-3	C4	CK45FB1H103K	CK	0.01µF	±5%	
B-1	C5	CC45SL1H101J	CC	100pF	±5%	
B-2	C6	CE04W1E100M	CE	10µF		25WV
	C7	No use				
B-2	C8	CE04W1E100M	CE	10µF		25WV
D-2	C9	CE04W1H010M	CE	1µF		50WV
E-2	C10	CE04W1V220M	CE	22µF		35WV
D-1	C11	CE04W1H3R3M	CE	3.3µF		50WV
D-2	C12	CK45FB1H103K	CK	0.01µF	±10%	
D-2	C13	CE04W1H3R3M	CE	3.3µF		50WV
D-2	C14	C91-0567-05	Polyester	10µF	±10%	100WV
E-2	C15	CK45FB1H103K	CK	0.01µF	±10%	
E-2	C16	CK45FB1H103K	CK	0.01µF	±10%	
D-2	C17	CQ93BP2A104F	CQ	0.1µF	±1%	100WV
D-2	C18	CK45FB1H103K	CK	0.01µF	±10%	
D-2	C19	CQ93M1H333K	CQ	0.033µF	±10%	
E-2	C20	CK45FB1H103K	CK	0.01µF	±10%	
D-2	C21	CQ93BP2A102F	CQ	1000pF	±1%	100WV
D-2	C22	CK45FB1H103K	CK	0.01µF	±10%	
D-2	C23	CC45SL1H331J	CC	330pF	±5%	
D-2	C24	CC45SL1H470J	CC	47pF	±5%	
D-2	C25	CM93BD2A680J	CM	68pF	±5%	100WV
C-2	C26	CK45FB1H103K	CK	0.01µF	±10%	
C-2	C27	CC45CH1H330J	CC	33pF	±5%	
C-2	C28	CE04W1E100M	CE	10µF		25WV
C-3	C29	CC45SL1H330J	CC	33pF	±5%	
	C30	No use				
	C31	No use				
B-4	C32	CC45SL1H101J	CC	100pF	±5%	
B-4	C33	CE04W1E100M	CE	10µF		25WV
B-4	C34	CE04W1E100M	CE	10µF		25WV
	C35	No use				
D-4	C36	CE04W1H3R3M	CE	3.3µF		50WV
D-3	C37	C91-0567-05	Polyester	10µF	±10%	100WV
	C38	No use				
D-3	C39	CQ93BP2A104F	CQ	0.1µF	±1%	100WV
	C40	No use				
D-3	C41	CQ93BP2A102F	CQ	1000pF	±1%	100WV
	C42	No use				
	C43	No use				
D-4	C44	CM93BD2A680J	CM	68pF	±5%	100WV
	C45	No use				
F-3	C46	CK45FB1H103K	CK	0.01µF	±10%	
	C47	CE04W1A100M	CE	10µF		10WV
F-2	C48	CE04W1C470M	CE	47µF		16WV
E-2	C49	CK45FB1H103K	CK	0.01µF	±10%	
E-2	C50	CK45FB1H103K	CK	0.01µF	±10%	
B-2	C51	CC45SL1H331J	CC	330pF	±5%	
B-3	C52	CQ93M1H102J	CQ	1000pF	±5%	
B-3	C53	CQ93M1H102J	CQ	1000pF	±5%	
C-2	C54	CE04W1H010M	CE	1µF		50WV
C-2	C55	CK45FB1H103K	CK	0.01µF	±10%	
	C56	No use				
	C57	CC45SL1H470J	CC	47pF	±5%	
	C58	No use				
F-4	C59	CK45FB1H103K	CK	0.01µF	±10%	
F-4	C60	CK45FB1H103K	CK	0.01µF	±10%	
F-4	C61	CK45FB1H103K	CK	0.01µF	±10%	
F-4	C62	CK45FB1H103K	CK	0.01µF	±10%	
D-2	C63	CK45FB1H103K	CK	0.01µF	±10%	
E-1	C64	CK45B2H472K	CK	4700pF	±10%	500WV
D-1	C65	CK45FB1H103K	CK	0.01µF	±10%	
F-4	C66	CK45B2H472K	CK	4700pF	±10%	500WV
D-4	C67	CE04W1V220M	CE	22µF		35WV
A-2	C68	CK45FB1H103K	CK	0.01µF	±10%	
A-2	C69	CK45FB1H103K	CK	0.01µF	±10%	
A-4	C70	CK45FB1H103K	CK	0.01µF	±10%	
D-1	C71	CK45B1H103K	CK	0.01µF	±10%	
E-4	C72	CK45FB2H472K	CK	4700pFF	±10%	500WV
D-4	C73	CK45FB1H103K	CK	0.01µF	±10%	
B-2	C74	CK45FB1H103K	CK	0.01µF	±10%	
	C75	No use				
	C76	No use				
B-1	C77	C90-0298-05	SCC	0.1µF		12WV
B-1	C78	C90-0298-05	SCC	0.1µF		12WV
C-1	C79	C90-0298-05	SCC	0.1µF		12WV
B-2	C80	C90-0298-05	SCC	0.1µF		12WV
B-2	C81	C90-0298-05	SCC	0.1µF		12WV
C-2	C82	C90-0298-05	SCC	0.1µF		12WV
B-3	C83	C90-0298-05	SCC	0.1µF		12WV
B-3	C84	C90-0298-05	SCC	0.1µF		12WV
C-3	C85	C90-0298-05	SCC	0.1µF		12WV
B-3	C86	C90-0298-05	SCC	0.1µF		12WV
B-3	C87	C90-0298-05	SCC	0.1µF		12WV
C-3	C88	C90-0298-05	SCC	0.1µF		12WV
B-2	C89	C90-0298-05	SCC	0.1µF		12WV
	C90	No use				
	C91	No use				
B-1	C92	CE04W1A101M	CE	100µF		10WV
B-2	C93	CE04W1A101M	CE	100µF		10WV
B-3	C94	CE04W1A470M	CE	47µF		10WV
B-3	C95	CE04W1A101M	CE	100µF		10WV
	C96	No use				
F-4	C97	CE04W1A221M	CE	220µF		10WV
D-2	C98	CE04W1C470M	CE	47µF		16WV
D-3	C99	CE04W1C470M	CE	47µF		16WV
C-2	C100	CE04W1C470M	CE	47µF		16WV
C-3	C101	CE04W1C331M	CE	330µF		16WV
F-3	C102	CE04W1C101M	CE	100µF		16WV
F-4	C103	CE04W1C101M	CE	100µF		16WV
D-2	C104	CE04W1E220M	CE	22µF		25WV
D-3	C105	CE04W1E330M	CE	33µF		25WV
D-3	C106	CE04W1E220M	CE	22µF		25WV
F-3	C107	CE04W1E101M	CE	100µF		25WV
	C108	No use				
	C109	No use				
E-1	C110	CE04W1J100M	CE	10µF		63WV
E-4	C111	CE04W1J100M	CE	10µF		63WV
F-2	C112	CE04W1C330M	CE	33µF		16WV
F-2	C113	CE04W1E220M	CE	22µF		25WV
A-4	C114	CE04W1C330M	CE	33µF		16WV
A-2	C115	CE04W1C330M	CE	33µF		16WV
D-3	C116	CE04W1H010M	CE	1µF		50WV
	C117	No use				
	C118	No use				
	C119	No use				

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
	C120	No use				
E-3	C121	CK45FB1H103K	CK	0.01μF	±10%	
E-3	C122	CK45FB1H103K	CK	0.01μF	±10%	
E-3	C123	CK45FB1H103K	CK	0.01μF	±10%	
	C124	No use				
	C125	No use				
	C126	No use				
A-1	C127	C90-0298-05	SCC	0.1μF		12WV
A-4	C128	C90-0298-05	SCC	0.1μF		12WV
A-2	C129	CE04W1C330M	CE	33μF		16WV
	C130	CC45SL1H390J	CC	39pF	±5%	
D-1	TC1	C05-0030-15	TC	20pF		
D-4	TC2	C05-0030-15	TC	20pF		
C-2	TC3	C05-0062-05	TC	6pF		
C-3	TC4	C05-0006205	TC	6pF		
D-2	L1	L40-1001-01	Ferri-inductor	10μH		
D-4	L2	L40-1001-01	Ferri-inductor	10μH		
B-1	IC1		IC	Digital	MC10103L	
B-1	IC2		IC	Digital	MC10131L	
D-1	IC3		IC	Linear	TL082CP	
B-4	IC4		IC	Digital	MC10103L	
B-4	IC5		IC	Digital	MC10131L	
D-4	IC6		IC	Linear	TL082CP	
C-1	IC7		IC	Digital	MC10104L	
C-2	IC8		IC	Digital	MC10103L	
	IC9	No use				
C-4	IC10		IC	Digital	MC10104L	
B-2	IC11		IC	Digital	MC10104L	
B-3	IC12		IC	Digital	MC10102L	
B-2	IC13		IC	Digital	MC10131L	
A-3	IC14		IC	Digital	SN7405N	
B-3	IC15		IC	Digital	MC10104L	
D-2	IC16		IC	Regulator	MC78L15CP	
	Q1	No use				
	Q2	No use				
B-2	Q3		TR	NPN	2SC536KNP (F)	
B-2	Q4		TR	NPN	2SC536KNP (F)	
C-1	Q5		TR	PNP	2SA838 (C)	
D-1	Q6		TR	NPN	2SC1215 (T or S)	
D-1	Q7		TR	NPN	2SC1973 (T)	
D-1	Q8		TR	PNP	2SA838 (C)	
E-1	Q9		TR	NPN	2SD438 (F)	
E-1	Q10		TR	NPN	2SC536KNP (F)	
E-2	Q11		TR	NPN	2SC536KNP (F)	
E-1	Q12		TR	NPN	2SC536KNP (F)	
D-2	Q13		TR	NPN	2SC536KNP (F)	
E-2	Q14		TR	NPN	2SC536KNP (F)	
D-2	Q15		TR	NPN	2SC536KNP (F)	
E-2	Q16		TR	NPN	2SC536KNP (F)	
D-2	Q17		TR	NPN	2SC536KNP (F)	
E-2	Q18		TR	NPN	2SC536KNP (F)	
D-2	Q19		FET	Dual	M74F (C)	
D-2	Q20		TR	NPN	2SC1047 (C)	
D-2	Q21		FET	Dual	M74F (C)	
C-2	Q22		TR	PNP	2SA838 (C)	
D-2	Q23		TR	NPN	2SC1407 (C)	
C-2	Q24		TR	NPN	2SC536KNP (F)	
C-2	Q25		TR	NPN	2SC536KNP (F)	
C-2	Q26		TR	NPN	2SC536KNP (F)	
	Q27	No use				
	Q28	No use				

Fig. & Index No.	Ref. No.	Parts No.	Name & Description		
E-2	Q29		TR	PNP	2SA838 (C)
E-3	Q30		TR	PNP	2SA838 (C)
	Q31	No use			
B-4	Q32		TR	NPN	2SC536KNP (F)
A-4	Q33		TR	NPN	2SC536KNP (F)
C-4	Q34		TR	PNP	2SA838 (C)
D-4	Q35		TR	NPN	2SC1215 (T or S)
D-4	Q36		TR	NPN	2SC1973 (T)
D-4	Q37		TR	PNP	2SA838 (C)
E-4	Q38		TR	NPN	2SD438 (F)
E-4	Q39		TR	NPN	2SC536KNP (F)
E-4	Q40		TR	NPN	2SC536KNP (F)
E-4	Q41		TR	NPN	2SC536KNP (F)
	Q42	No use			
E-3	Q43		TR	NPN	2SC536KNP (F)
	Q44	No use			
E-3	Q45		TR	NPN	2SC536KNP (F)
	Q46	No use			
E-3	Q47		TR	NPN	2SC536KNP (F)
D-4	Q48		FET	Dual	M74F (C)
D-3	Q49		TR	NPN	2SC1047 (C)
	Q50	No use			
D-3	Q51		FET	Dual	M74F (C)
	Q52	No use			
F-2	Q53		TR	NPN	2SC536KNP (F)
F-3	Q54		TR	NPN	2SC536KNP (F)
E-3	Q55		TR	NPN	2SC1047 (C)
E-3	Q56		TR	NPN	2SC1047 (C)
E-3	Q57		TR	NPN	2SC1047 (C)
E-3	Q58		TR	NPN	2SC1047 (C)
E-3	Q59		TR	NPN	2SC1047 (C)
E-2	Q60		TR	NPN	2SC1047 (C)
F-2	Q61		TR	NPN	2SC1047(C)
E-2	Q62		TR	PNP	2SA838 (C)
F-2	Q63		TR	PNP	2SA838 (C)
	Q64	No use			
	Q65	No use			
	Q66	No use			
	Q67	No use			
E-2	Q68		TR	NPN	2SC536KNP (F)
E-2	Q69		TR	NPN	2SC536KNP (F)
F-1	Q70		TR	NPN	2SC1047 (C)
F-2	Q71		TR	NPN	2SC1047 (C)
A-2	Q72		TR	PNP	2SA838 (C)
A-2	Q73		TR	NPN	2SC1215 (T or S)
A 2	Q74		TR	PNP	2SA838 (C)
A-2	Q75		TR	NPN	2SC1215 (T or S)
	Q76	No use			
A-3	Q77		TR	PNP	2SA838 (C)
C-3	Q78		TR	PNP	2SA838 (C)
C-3	Q79		TR	NPN	2SC536KNP (F)
C-2	Q80		TR	PNP	2SA838 (C)
C-2	Q81		TR	NPN	2SC536KNP (F)
A-1	D1		Diode	Varistor	SV-03Y
B-2	D2		Diode	Silicon	GMA-01
C-2	D3		Diode	Silicon	GMA-01
	D4		Diode	Silicon	GMA-01
C-1	D5		Diode	Silicon	GMA-01
C-1	D6		Diode	Silicon	DS442X
C-1	D7		Diode	Silicon	DS442X
D-1	D8		Diode	Silicon	GMA-01
D-1	D9		Diode	Silicon	GMA-01
D-1	D10		Diode	Silicon	GMA-01
	D11		Diode	Silicon	GMA-01

PARTS LIST

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description
E-1	D12		Diode Zener WZ-150
E-1	D13		Diode Silicon DS442X
	D14	No use	
D-2	D15		Diode Silicon GMA-01
C-2	D16		Diode Silicon GMA-01
	D17		Diode Zener YZ-030
	D18		Diode Silicon GMA-01
A-4	D19		Diode Varistor SV-03Y
B-4	D20		Diode Silicon GMA-01
	D21		Diode Silicon GMA-01
	D22		Diode Silicon GMA-01
C-4	D23		Diode Silicon GMA-01
C-4	D24		Diode Silicon DS442X
C-4	D25		Diode Silicon GS442X
D-4	D26		Diode Silicon GMA-01
	D27	No use	
E-4	D28		Diode Zener WZ-150
E-4	D29		Diode Silicon DS442X
	D30	No use	
	D31	No use	
A-3	D32		Diode Silicon GMA-01
E-3	D33		Diode Silicon GMA-01
E-3	D34		Diode Silicon GMA-01
E-3	D35		Diode Silicon GMA-01
E-3	D36		Diode Silicon GMA-01
E-2	D37		Diode Zener WZ-120
E-2	D38		Diode Zener WZ-120
	D39	No use	
B-3	D40		Diode Silicon GMA-01
B-3	D41		Diode Silicon GMA-01
B-3	D42		Diode Silicon GMA-01
B-3	D43		Diode Silicon GMA-01
	D44		Diode Silicon DS442X
	D45		Diode Varistor SV-06Y
A-3	D46		Diode Silicon GMA-01
	D47		Diode Silicon DS442X
A-3	D48		Diode Silicon GMA-01
A-3	D49		Diode Silicon GMA-01
A-3	D50		Diode Silicon GMA-01
C-3	D51		Diode Zener WZ-100
C-2	D52		Diode Silicon GMA-01
E-3	D53		Diode Silicon GMA-01
E-3	D54		Diode Silicon GMA-01
D-4	D55		Diode Silicon GMA-01
D-4	D56		Diode Silicon GMA-01
C-4	D57		Diode Silicon GMA-01
A-3	D58		Diode Silicon GMA-01
C-2	D59		Diode Silicon DS442X
A-3	D60		Diode Silicon GMA-01
A-3	D61		Diode Silicon GMA-01
B-3	D62		Diode Silicon GMA-01
B-1	D63		Diode Silicon GMA-01
E-1	D64		Diode Silicon GMA-01
E-1	D65		Diode Varistor SV-06Y
E-1	D66		Diode Silicon GMA-01
C-3	P13	E40-0276-05	Pin connector 2P
A-3	P14	E40-0776-05	Pin connector 7P
A-2	P28	E40-0476-05	Pin connector 4P
F-1	P35	E40-0476-05	Pin connector 4P
F-2	P37	E40-0776-05	Pin connector 7P
C-2	P38	E40-0376-05	Pin connector 3P
D-2	P39	E40-0776-05	Pin connector 7P
E-2	P40	E40-0876-05	Pin connector 8P
E-3	P41	E40-0876-05	Pin connector 8P
	P42	No use	
F-2	P43	E40-0276-05	Pin connector 2P
A-4	P44	E40-0276-05	Pin connector 2P
E-4	P45	E40-0676-05	Pin connector 6P
A-1	P46	E40-0276-05	Pin connector 2P
E-4	P47	E40-0476-05	Pin connector 4P
A-3	P48	E40-1811-05	Pin connector 18P
F-4	P49	E40-0676-05	Pin connector 6P
	P50	No use	
D-2	P57	E40-0376-05	Pin connector 3P

PARTS LIST

HORIZONTAL OUTPUT AMPLIFIER UNIT X74-1230-01

Fig. & Index No.	Ref. No.	Parts No.	Name & Description
C-1	R1	RD14BB2C272J	RD 2.7kΩ
C-3	R2	RD14BB2C272J	RD 2.7kΩ
C-2	R3	RD14BB2C470J	RD 47Ω
C-3	R4	RD14BB2C470J	RD 47Ω
C-2	R5	RD14BB2C152J	RD 1.5kΩ
C-2	R6	RD14BB2H473J	RD 47kΩ ±5% 1/2W
C-2	R7	RD14BB2H473J	RD 47kΩ ±5% 1/2W
D-2	R8	RD14BB2C821J	RD 820Ω
C-2	R9	RD14BB2C821J	RD 820Ω
D-2	R10	RD14BB2C102J	RD 1kΩ
D-2	R11	RD14BB2C102J	RD 1kΩ
	R12	No use	
	R13	No use	
C-1	R14	RS14GB3A223J	RS 22kΩ ±5% 1W
C-3	R15	RS14GB3A223J	RS 22kΩ ±5% 1W
D-1	R16	RD14BB2C134J	RD 130kΩ
D-3	R17	RD14BB2C134J	RD 130kΩ
E-2	R18	RD14BY2H123J	RD 12kΩ ±5% 1/2W
E-2	R19	RD14BB2C102J	RD 1kΩ
E-2	R20	RD14BB2C102J	RD 1kΩ
E-1	R21	RD14BB2C220J	RD 22Ω
E-3	R22	RD14BB2C220J	RD 22Ω
F-2	R23	RD14BB2C471J	RD 470Ω
E-2	R24	RD14BB2C471J	RD 470Ω
	R25	No use	
B-2	R26	RD14BB2C472J	RD 4.7kΩ
B-2	R27	RD14BB2C472J	RD 4.7kΩ
B-2	R28	RD14BB2C271J	RD 270Ω
B-2	R29	RD14BB2C512J	RD 5.1kΩ
C-2	C1	CK45B2H472K	CK 4700pF ±10% 500WV
D-2	C2	CK45B1H103K	CK 0.01μF ±10%
	C3	No use	
	C4	No use	
D-2	C5	CK45B1H103K	CK 0.01μF ±10%
D-2	C6	CK45B1H103K	CK 0.01μF ±10%
	C7	No use	
	C8	No use	
C-3	C9	CK45B1H103K	CK 0.01μF ±10%
C-1	C10	CC45CH2H010C	CC 1pF ±0.25pF500WV
D-1	C11	CC45CH2H010C	CC 1pF ±0.25pF500WV
C-3	C12	CC45CH2H010C	CC 1pF ±0.25pF500WV
D-3	C13	CC45CH2H010C	CC 1pF ±0.25pF500WV
B-3	C14	CK45B1H103K	CK 0.01μF ±10%
E-2	C15	CK45B2H472K	CK 4700pF ±10% 500WV
E-2	C16	CK45B2H472K	CK 4700pF ±10% 500WV
D-2	C17	CK45B2H472K	CK 4700pF ±10% 500WV
D-3	C18	C92-0549-05	Tantalum 1μF 35WV
E-2	C19	CK45B1H103K	CK 0.01μF ±10%
E-2	C20	C91-0549-05	Tantalum 1μF 35WV
F-2	C21	CK45B2H472K	CK 4700pF ±10% 500WV
B-2	C22	CK45B1H103K	CK 0.01μF ±10%
B-2	C23	CE04W1C101M	CE 100μF 16WV
B-3	C24	CE04W1C101M	CE 100μF 16WV
	C25	No use	
B-2	C26	CE04W2A100M	CE 10μF 100WV
D-2	C27	CE04W2C2R2M	CE 2.2μF 160WV
D-2	C28	CK45B1H103K	CK 0.01μF ±10%
B-2	L1	L40-1011-04	Ferri-inductor 100μH
B-3	L2	L40-1011-04	Ferri-inductor 100μH
	L3	No use	
B-2	L4	L40-1011-04	Ferri-inductor 100μH
B-3	L5	L40-1011-04	Ferri-inductor 100μH
	D1	No use	
	D2	No use	
	D3	No use	
	D4	No use	
	D5	No use	
	D6	No use	
	D7	No use	
	D8	No use	
E-2	D9		Diode Silicon DS442X
E-2	D10		Diode Silicon DS442X
E-2	D11		Diode Silicon DS442X
	D12	No use	
E-2	D13		Diode Zener WZ-050
C-2	Q1		TR PNP 2SA838 (C)
C-2	Q2		TR PNP 2SA838 (C)
	Q3	No use	
	Q4	No use	
D-2	Q5		TR PNP 2SA838 (C)
D-2	Q6		TR PNP 2SA838 (C)
D-1	Q7		TR NPN 2SC805A-2 (2, 3)
D-3	Q8		TR NPN 2SC805A-2 (2, 3)
E-1	Q9		TR PNP 2SA923-2 (2, 3)
E-3	Q10		TR PNP 2SA923-2 (2, 3)
B-2	Q11		TR NPN 2SC536KNP (F)
B-2	Q12		TR NPN 2SC536KNP (F)
		E31-0747-05	Lead wire with connector
B-2	P27	E40-0876-05	Pin connector 8P
B-1	P35	E40-0476-05	Pin connector 4P
B-1	P36	E40-0676-05	Pin connector 6P

PARTS LIST

HORIZONTAL MODE CONTROL UNIT X-77-1130-01

Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
B-1	R1	RD14BB2C393J	RD	39kΩ		
B-1	R2	RD14BB2C393J	RD	39kΩ		
B-1	R3	RD14BB2C393J	RD	39kΩ		
B-1	R4	RD14BB2C393J	RD	39kΩ		
	R5	No use				
B-1	R6	RD14BB2C393J	RD	39kΩ		
B-2	R7	RD14BB2C824J	RD	820kΩ		
B-1	R8	RD14BB2C393J	RD	39kΩ		
B-2	R9	RD14BB2C824J	RD	820kΩ		
B-1	R10	RD14BB2C393J	RD	39kΩ		
B-2	R11	RD14BB2C824J	RD	820kΩ		
B-1	R12	RD14BB2C393J	RD	39kΩ		
B-1	R13	RD14BB2C473J	RD	47kΩ		
B-1	R14	RD14BB2C473J	RD	47kΩ		
B-1	R15	RD14BB2C184J	RD	180kΩ		
C-1	R16	RD14BB2C391J	RD	390Ω		
C-1	R17	RD14BB2C391J	RD	390Ω		
C-1	R18	RD14BB2C391J	RD	390Ω		
C-1	R19	RD14BB2C391J	RD	390Ω		
	R20	No use				
C-1	R21	RD14BB2C391J	RD	390Ω		
C-2	R22	RD14BB2C393J	RD	39kΩ		
C-2	R23	RD14BB2C393J	RD	39kΩ		
C-2	R24	RD14BB2C393J	RD	39kΩ		
C-2	R25	RD14BB2C393J	RD	39kΩ		
B-2	R26	RD14BB2C824J	RD	820kΩ		
B-2	R27	RD14BB2C393J	RD	39kΩ		
A-2	R28	RD14BB2C824J	RD	820kΩ		
B-2	R29	RD14BB2C393J	RD	39kΩ		
B-2	R30	RD14BB2C824J	RD	820kΩ		
B-2	R31	RD14BB2C393J	RD	39kΩ		
B-1	R32	RD14BB2C473J	RD	47kΩ		
B-1	R33	RD14BB2C473J	RD	47kΩ		
B-1	R34	RD14BB2C184J	RD	180kΩ		
C-2	R35	RD14BB2C391J	RD	390Ω		
C-2	R36	RD14BB2C391J	RD	390Ω		
C-2	R37	RD14BB2C391J	RD	390Ω		
C-2	R38	RD14BB2C562J	RD	5.6kΩ		
C-2	R39	RD14BB2C562J	RD	5.6kΩ		
C-2	R40	RD14BB2C562J	RD	5.6kΩ		
C-2	R41	RD14BB2C184J	RD	180kΩ		
C-2	R42	RD14BB2C223J	RD	22kΩ		
C-1	R43	RD14BB2C473J	RD	47kΩ		
E-1	R44	RD14BB2C103J	RD	10kΩ		
D-2	R45	RD14BB2C472J	RD	4.7kΩ		
D-2	R46	RD14BB2C332J	RD	3.3kΩ		
D-2	R47	RD14BB2C272J	RD	2.7kΩ		
D-2	R48	RD14BB2C331J	RD	330Ω		
C-2	R49	RD14BB2C561J	RD	560Ω		
D-2	R50	RD14BB2C272J	RD	2.7kΩ		
D-2	R51	RD14BB2C222J	RD	2.2kΩ		
	R52	No use				
	R53	No use				
	R54	No use				
	R55	No use				
	R56	No use				
	R57	No use				
	R58	No use				
	R59	No use				
	R60	No use				
	R61	No use				
	R62	No use				
	R63	No use				
	R64	No use				
	R65	No use				
	R66	No use				
	R67	No use				
	R68	No use				
	R69	No use				
E-1	R70	RN14BK2B3600F	RN	360Ω	±1%	1/8W
E-1	R71	RN14BK2B30R0F	RN	30Ω	±1%	1/8W
	R72	No use				
E-1	R73	RD14BB2C223J	RD	22kΩ		
E-1	R74	RD14BB2C103J	RD	10kΩ		
E-1	R75	RD14BB2C103J	RD	10kΩ		
E-1	R76	RN14BK2B1003F	RN	100kΩ	±1%	1/8W
E-1	R77	RN14BK2B9102F	RN	91kΩ	±1%	1/8W
E-1	R78	RD14BB2C472J	RD	4.7kΩ		
A-3	R79	RD14BB2E470J	RD	47Ω	±5%	1/4W
	R80	No use				
	R81	No use				
	R82	No use				
B-3	R83	RN14BK2H1004F	RN	1MΩ	±1%	1/2W
	R84	RD14BB2C104J	RD	100kΩ		
B-2	R85	RD14BB2C101J	RD	100Ω		
B-2	R86	RN14BK2B2701F	RN	2.7kΩ	±1%	1/8W
B-2	R87	RN14BK2B2701F	RN	2.7kΩ	±1%	1/8W
B-2	R88	RD14BB2C220J	RD	22Ω		
B-2	R89	RD14BB2C220J	RD	22Ω		
B-2	R90	RD14BB2C220J	RD	22Ω		
B-2	R91	RN14BK2B8200F	RN	820Ω	±1%	1/8W
B-2	R92	RN14BK2B8200F	RN	820Ω	±1%	1/8W
B-2	R93	RD14BB2C220J	RD	22Ω		
A-2	R94	RN14BK2B39R0F	RN	39Ω	±1%	1/8W
A-2	R95	RN14BK2B39R0F	RN	39Ω	±1%	1/8W
A-2	R96	RD14BB2C122J	RD	1.2kΩ		
C-3	R97	RD14BB2E470J	RD	47Ω	±5%	1/4W
	R98	No use				
	R99	No use				
	R100	No use				
C-3	R101	RN14BK2H1004F	RN	1MΩ	±1%	1/2W
C-2	R102	RD14BB2C104J	RD	100kΩ		
B-2	R103	RD14BB2C101J	RD	100Ω		
B-2	R104	RN14BK2B2701F	RN	2.7kΩ	±1%	1/8W
B-2	R105	RN14BK2B2701F	RN	2.7kΩ	±1%	1/8W
B-2	R106	RD14BB2C220J	RD	22Ω		
B-2	R107	RD14BB2C220J	RD	22Ω		
B-2	R108	RD14BB2C220J	RD	22Ω		
B-2	R109	RN14BK2B8200F	RN	820Ω	±1%	1/8W
B-2	R110	RN14BK2B8200F	RN	820Ω	±1%	1/8W
B-2	R111	RD14BB2C220J	RD	22Ω		
C-2	R112	RN14BK2B39R0F	RN	39Ω	±1%	1/8W
C-2	R113	RN14BK2B39R0F	RN	39Ω	±1%	1/8W
	R114	No use				
	R115	No use				
	R116	No use				
C-1	R117	RD14BB2C472J	RD	4.7kΩ		
D-1	R118	RD14BB2C472J	RD	4.7kΩ		
C-1	R119	RD14BB2C472J	RD	4.7kΩ		
C-1	R120	RD14BB2C563J	RD	56kΩ		
	R200	RD14BB2C561J	RD	560Ω		
E-1	VR1	R12-0542-05	VR	200Ω		
E-1	VR2	R12-5517-05	VR	100kΩ		
B-1	C1	CC45SL1H101J	CC	100pF	±5%	
A-1	C2	CC45SL1H101J	CC	100pF	±5%	
A-1	C3	CC45SL1H101J	CC	100pF	±5%	

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
A-1	C4	CC45SL1H101J	CC	100pF	±5%	
	C5	No use				
B-1	C6	CC45SL1H101J	CC	100pF	±5%	
B-1	C7	CK45FB1H103K	CK	0.01μF	±10%	
C-2	C8	CC45SL1H101J	CC	100pF	±5%	
C-2	C9	CC45SL1H101J	CC	100pF	±5%	
C-2	C10	CC45SL1H101J	CC	100pF	±5%	
C-2	C11	CC45SL1H101J	CC	100pF	±5%	
B-1	C12	CK45FB1H103K	CK	0.01μF	±10%	
E-2	C13	CK45FB1H103K	CK	0.01μF	±10%	
D-1	C14	CK45FB1H103K	CK	0.01μF	±10%	
D-1	C15	CE04W1C471M	CE	470μF		16WV
	C16	No use				
	C17	No use				
	C18	No use				
	C19	No use				
	C20	No use				
	C21	No use				
E-1	C22	CC45SL1H471J	CC	470pF	±5%	
	C23	No use				
	C24	No use				
	C25	No use				
E-1	C26	CE04W1C471M	CE	470μF		16WV
E-1	C27	CQ93BP2A472F	CQ	4700pF	±1%	100WV
E-1	C28	CQ93BP2A472F	CQ	4700pF	±1%	100WV
	C29	No use				
B-2	C30	C91-0501-05	MF	0.047μF		630WV
	C31	No use				
B-2	C32	CK45FB1H103K	CK	0.01μF	±10%	
	C33	No use				
	C34	CK45FB1H103K	CK	0.01μF	±10%	
	C35	No use				
B-1	C36	C91-0501-05	MF	0.047μF		630WV
	C37	No use				
E-2	C38	CE04W1C471M	CE	470μF		16WV
E-1	C39	CK45FB1H103K	CK	0.01μF	±10%	
E-2	C40	CK45FB1H103K	CK	0.01μF	±10%	
E-2	C41	CE04W1C471M	CE	470μF		16WV
E-2	C42	CK45FB1H103K	CK	0.01μF	±10%	
F-2	C43	CE04W1C471M	CE	470μF		16WV
E-2	C44	CK45FB1H103K	CK	0.01μF	±10%	
F-2	C45	CE04W1C471M	CE	470μF		16WV
	C46	No use				
	C47	CC45CH1H100D	CC	10pF	±0.5pF	
	C48	CC45CH1H100D	CC	10pF	±0.5pF	
D-1	C100	CE04W1A102M	CE	1000μF		10WV
B-3	TC1	C05-0411-05	TC	10pF		
	TC2	No use				
	TC3	No use				
C-3	TC4	C05-0411-05	TC	10pF		
E-1	L1	L40-4701-03	Ferri inductor	47μH		
F-1	L2	L40-1011-04	Ferri inductor	100μH		
E-1	L3	L40-4701-03	Ferri inductor	47μH		
F-1	L4	L40-1011-03	Ferri inductor	100μH		
F-1	L5	L40-1011-03	Ferri inductor	100μH		
B-2	IC1		IC	Digital	MC14584BCP	
C-1	IC2		IC	Digital	MC14069UBCP	
C-2	IC3		IC	Digital	MC14001BCP	
C-1	IC4		IC	Digital	MC14174BCP	
D-1	IC5		IC	Digital	MC14503BCP	
D-2	IC6		IC	Digital	SN7442AN	

Fig. & Index No.	Ref. No.	Parts No.	Name & Description		
C-2	IC7		IC	Digital	MC14013BCP
D-2	IC8		IC	Digital	MC14011BCP
E-2	IC9		IC	Digital	SN74LS04N
	IC10	No use			
	IC11	No use			
	IC12	No use			
	IC13	No use			
	IC14	No use			
	IC15	No use			
	IC16	No use			
E-2	IC17		IC	Regulator	MC78L05C
B-1	D1		Diode	Silicon	DS442X
B-1	D2		Diode	Silicon	DS442X
	D3	No use			
B-1	D4		Diode	Silicon	DS442X
B-1	D5		Diode	Silicon	DS442X
B-1	D6		Diode	Silicon	DS442X
A-1	D7		Diode	Silicon	DS442X
	D8	No use			
B-1	D9		Diode	Silicon	DS442X
B-1	D10		Diode	Silicon	DS442X
B-1	D11		Diode	Silicon	DS442X
B-1	D12		Diode	Silicon	DS442X
C-2	D13		Diode	Silicon	DS442X
C-2	D14		Diode	Silicon	DS442X
C-2	D15		Diode	Silicon	DS442X
B-1	D16		Diode	Silicon	DS442X
B-1	D17		Diode	Silicon	DS442X
D-1	D18		Diode	Silicon	DS442X
D-1	D19		Diode	Silicon	DS442X
D-1	D20		Diode	Silicon	DS442X
D-2	D21		Diode	Silicon	DS442X
D-2	D22		Diode	Silicon	DS442X
D-2	D22		Diode	Silicon	DS442X
D-2	D23		Diode	Silicon	DS442X
	D24	No use			
	D25	No use			
	D26	No use			
	D27	No use			
	D28	No use			
	D29	No use			
	D30	No use			
D-1	D31		Diode	Silicon	DS442X
	D32	No use			
	D33	No use			
	D34	No use			
	D35	No use			
	D36	No use			
	D37	No use			
E-1	D38		Diode	Gerumanium	IN60
E-1	D39		Diode	Silicon	DS442X
E-1	D40		Diode	Silicon	DS442X
B-2	D41		Diode	Silicon	1S1544A
B-2	D42		Diode	Silicon	DS442X
B-2	D43		Diode	Silicon	DS442X
B-2	D44		Diode	Silicon	DS442X
B-2	D45		Diode	Silicon	DS442X
	D46	No use			
B-2	D47		Diode	Silicon	1S1544A
C-2	D48		Diode	Silicon	DS442X
C-2	D49		Diode	Silicon	DS442X
C-2	D50		Diode	Silicon	DS442X
C-2	D51		Diode	Silicon	DS442X
	D52	No use			

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description
B-2	D53		Diode Silicon DS442X
B-2	D54		Diode Silicon DS442X
	D100		Diode Silicon DS442X
C-2	Q1		TR NPN 2SC536KNP (F)
C-2	Q2		TR NPN 2SC536KNP (F)
C-2	Q3		TR NPN 2SC536KNP (F)
D-1	Q4		TR NPN 2SC536KNP (F)
D-2	Q5		TR PNP 2SA608KNP (F)
D-2	Q6		TR PNP 2SA608KNP (F)
D-2	Q7		TR NPN 2SC536KNP (F)
	Q8	No use	
	Q9	No use	
E-1	Q10		TR PNP 2SA608KNP (F)
E-1	Q11		TR PNP 2SA608KNP(F)
E-1	Q12		TR PNP 2SA608KNP (F)
B-2	Q13		FET Dual DN1901
B-2	Q14		TR NPN 2SC1215 (T or S)
B-2	Q15		TR NPN 2SC1215 (T or S)
	Q16	No use	
B-2	Q17		FED Dual DN1901
B-2	Q18		TR NPN 2SC1215 (T or S)
B-2	Q19		TR NPN 2SC1215 (T or S)
D-1	P6	E40-0576-05	Pin connector 5P
A-2	P11	E40-0477-05	Pin connector 4P
C-2	P12	E40-0476-05	Pin connector 4P
F-1	P36	E40-0676-05	Pin connector 6P
D-3	P48	E40-1811-05	Pin connector 18P
F-1	P49	E40-0676-05	Pin connector 6P
E-1	P52	E40-0276-05	Pin connector 2P
C-3	P54	E40-1211-05	Pin connector 12P
B-1	P55	E40-1511-05	Pin connector 15P
A-3	P56	E40-0277-05	Pin connector 2P
C-1	TP1	E23-0508-04	Test terminal
E-1	TP2	E40-0211-05	Pin connector 2P
		E23-0503-05	Terminal

A TRIGGER SWITCH UNIT X77-1110-01

Fig. & Index No.	Ref. No.	Parts No.	Name & Description
B-1	R1	RD14BB2C510J	RD 51Ω
B-1	R2	RD14BB2C101J	RD 100Ω
B-2	R3	RD14BB2C101J	RD 100Ω
A-2	R4	RD14BB2C510J	RD 51Ω
	R5	No use	
	R6	No use	
C-3	R7	RD14BB2C473J	RD 47kΩ
B-3	R8	RD14BB2C473J	RD 47kΩ
	R9	No use	
	R10	No use	
	R11	No use	
	R12	No use	
B-4	R13	RD14BB2C103J	RD 10kΩ
B-4	R14	RD14BB2C103J	RD 10kΩ
C-3	R15	RD14BB2C471J	RD 470Ω
	R16	No use	
C-2	R17	RD14BB2C123J	RD 12kΩ
C-2	R18	RD14BB2C103J	RD 10kΩ
C-2	R19	RD14BB2C103J	RD 10kΩ
D-1	R20	RD14BB2C473J	RD 47kΩ
D-1	R21	RD14BB2C223J	RD 22kΩ
C-3	R22	RD14BB2C220J	RD 22Ω
C-3	R23	RD14BB2C101J	RD 100Ω
C-3	R24	RD14BB2E105J	RD 1MΩ ±5% 1/4W
D-3	R25	RD14BB2E105J	RD 1MΩ ±5% 1/4W
D-3	R26	RN14BK2B3001F	RN 3kΩ ±1% 1/8W
D-3	R27	RN14BK2B3001F	RN 3kΩ ±1% 1/8W
D-3	R28	RD14BB2C220J	RD 22Ω
D-3	R29	RD14BB2C220J	RD 22Ω
D-3	R30	RD14BB2C562J	RD 5.6kΩ
D-3	R31	RD14BB2C562J	RD 5.6kΩ
D-3	R32	RN14BK2B2200F	RN 220Ω ±1% 1/8W
D-3	R33	RN14BK2B2200F	RN 220Ω ±1% 1/8W
C-1	R34	RN14BK2B1501F	RN 1.5kΩ ±1% 1/8W
E-2	R35	RN14BK2B1001F	RN 1kΩ ±1% 1/8W
C-1	R36	RN14BK2B7500F	RN 750Ω ±1% 1/8W
C-1	R37	RN14BK2B2700F	RN 270Ω ±1% 1/8W
E-2	R38	RN14BK2B2700F	RN 270Ω ±1% 1/8W
C-1	R39	RD14BB2C220J	RD 22Ω
C-1	R40	RD14BB2C220J	RD 22Ω
E-2	R41	RD14BB2C100J	RD 10Ω
E-1	R42	RD14BB2C680J	RD 68Ω
E-2	R43	RD14BB2C680J	RD 68Ω
	R44	No use	
	R45	No use	
D-1	R46	RD14BB2C220J	RD 22Ω
D-2	R47	RD14BB2C220J	RD 22Ω
D-2	R48	RD14BB2C473J	RD 47kΩ
D-2	R49	RD14BB2C473J	RD 47kΩ
D-2	R50	RD14BB2C220J	RD 22Ω
D-2	R51	RD14BB2C220J	RD 22Ω
D-2	R52	RD14BB2C271J	RD 270Ω
D-2	R53	RD14BB2C271J	RD 270Ω
D-2	R54	RD14BB2C102J	RD 1kΩ
C-2	R55	RD14BB2C220J	RD 22Ω
C-2	R56	RD14BB2C470J	RD 47Ω
	R57	No use	
	R58	No use	
C-2	R59	RD14BB2C243J	RD 24kΩ
C-2	R60	RD14BB2C363J	RD 36kΩ
B-3	VR1	R01-2510-05	VR (attached S3a, b, 4) 5kΩ
B-3	VR2	R12-3516-05	VR 10kΩ
B-4	VR3	R12-0532-05	VR 100Ω
B-1	C1	C91-0502-05	MF 0.01μF 630WV
B-3	C2	CC45CH1H680J	CC 68pF ±5%

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description
B-3	C3	CC45CH1H680J	CC 68pF ±5%
	C4	No use	
	C5	No use	
C-3	C6	CK45B1H103K	CK 0.01μF ±10%
C-2	C7	CE04W1H3R3M	CE 3.3μF 50WV
C-2	C8	CK45B1H103K	CK 0.01μF ±10%
D-3	C9	CC45CH1H220J	CC 22pF ±5%
D-3	C10	CC45CH1H220J	CC 22pF ±5%
	C11	No use	
	C12	No use	
D-2	C13	CC45CH1H220J	CC 22pF ±5%
D-4	C14	CK45B1H103K	CK 0.01μF ±10%
B-3	C15	*C91-0549-05*	*Tantalum* 1μF 35WV
D-4	C16	CE04W1C330M	CE 33μF 16WV
D-4	C17	CE04W1C330M	CE 33μF 16WV
D-4	C18	CK45B1H103K	CK 0.01μF ±10%
D-3	C19	CK45B1H103K	CK 0.01μF ±10%
D-1	C20	CK45B1H103K	CK 0.01μF ±10%
E-1	C21	CK45B1H103K	CK 0.01μF ±10%
D-3	C22	CK45B1H103K	CK 0.01μF ±10%
B-4	C23	C91-0549-05	Tantalum 1μF 35WV
E-4	C24	CE04W1C330M	CE 33μF 16WV
E-3	C25	CE04W1C330M	CE 33μF 16WV
C-2	C26	CK45B1H103K	CK 0.01μF ±10%
D-2	C27	CK45B1H103K	CK 0.01μF ±10%
E-2	C28	CK45B1H103K	CK 0.01μF ±10%
	C29	No use	
D-2	C30	CK45B1H103K	CK 0.01μF ±10%
	C31	CK45B1H103K	CK 0.01μF ±10%
E-2	TC1	*C05-0412-05*	TC 20pF
D-3	L1	L40-2201-03	Ferri-inductor 22μH
E-3	L2	L40-2201-03	Ferri-inductor 22μH
C-2	D1		Diode Silicon DS442X
E-1	D2		Diode Silicon DS442X
E-2	D3		Diode Silicon DS442X
E-1	D4		Diode Silicon DS442X
E-2	D5		Diode Silicon DS442X
	Q1	No use	
	Q2	No use	
C-2	Q3		TR NPN 2SC536KNP (F)
C-2	Q4		TR NPN 2SC536KNP (F)
C-3	Q5		FET Dual DN1901
D-3	Q6		TR NPN 2SC1215 (T or S)
D-3	Q7		TR NPN 2SC1215 (T or S)
D-2	Q8		TR PNP 2SA1161
E-2	Q9		TR PNP 2SA1161
C-2	Q10		TR NPN 2SC2671
D-2	IC1		IC Linear CA3102E
B-1	P15	E40-1077-05	Pin connector 10P
C-1	P46	E40-0276-05	Pin connector 2P
E-2	P47	E40-0476-05	Pin connector 4P

B TRIGGER SWITCH UNIT X77-1120-01

Fig. & Index No.	Ref. No.	Parts No.	Name & Description
C-3	R1	RD14BB2C101J	RD 100Ω
C-3	R2	RD14BB2C101J	RD 100Ω
	R3	No use	
	R4	No use	
	R5	No use	
B-2	R6	RD14BB2C103J	RD 10kΩ
B-2	R7	RD14BB2C103J	RD 10kΩ
C-2	R8	RD14BB2C471J	RD 470Ω
C-3	R9	RD14BB2C220J	RD 22Ω
C-2	R10	RD14BB2C101J	RD 100Ω
C-3	R11	RD14BB2E105J	RD 1MΩ ±5% 1/4W
C-2	R12	RD14BB2E105J	RD 1MΩ ±5% 1/4W
C-3	R13	RN14BK2B3001F	RN 3kΩ ±1% 1/8W
C-3	R14	RN14BK2B3001F	RN 3kΩ ±1% 1/8W
C-2	R15	RD14BB2C220J	RD 22Ω
C-2	R16	RD14BB2C220J	RD 22Ω
C-2	R17	RD14BB2C562J	RD 5.6kΩ
C-2	R18	RD14BB2C562J	RD 5.6kΩ
C-2	R19	RN14BK2B2200F	RN 220Ω ±1% 1/8W
C-2	R20	RN14BK2B2200F	RN 220Ω ±1% 1/8W
D-2	R21	RN14BK2B1501F	RN 1.5kΩ ±1% 1/8W
D-2	R22	RN14BK2B1501F	RN 1.5kΩ ±1% 1/8W
D-2	R23	RN14BK2B7500F	RN 750Ω ±1% 1/8W
D-2	R24	RN14BK2B2700F	RN 270Ω ±1% 1/8W
D-2	R25	RN14BK2B2700F	RN 270Ω ±1% 1/8W
D-2	R26	RD14BB2C220J	RD 22Ω
D-2	R27	RD14BB2C220J	RD 22Ω
E-2	R28	RD14BB2C100J	RD 10Ω
E-2	R29	RD14BB2C680J	RD 68Ω
E-2	R30	RD14BB2C680J	RD 68Ω
	R31	No use	
	R32	No use	
D-2	R33	RD14BB2C220J	RD 22Ω
D-2	R34	RD14BB2C220J	RD 22Ω
D-2	R35	RD14BB2C473J	RD 47kΩ
D-2	R36	RD14BB2C473J	RD 47kΩ
D-2	R37	RD14BB2C220J	RD 22Ω
D-2	R38	RD14BB2C220J	RD 22Ω
D-2	R39	RD14BB2C271J	RD 270Ω
D-2	R40	RD14BB2C271J	RD 270Ω
D-3	R41	RD14BB2C220J	RD 22Ω
D-3	R42	RD14BB2C470J	RD 47Ω
C-3	R43	RD14BB2C510J	RD 51Ω
C-3	R44	RD14BB2C222J	RD 2.2kΩ
D-3	R45	RD14BB2C470J	RD 47Ω
C-3	R46	RD14BB2C821J	RD 820Ω
C-2	VR1	R01-2511-05	VR 5kΩ
B-2	VR2	R12-3516-05	VR 10kΩ
E-2	VR3	R12-0532-05	VR 100Ω
B-3	C1	*C91-0502-05*	*MF* *0.01μF* 630WV
	C2	No use	
	C3	No use	
C-2	C4	CK45B1H103K	CK 0.01μF ±10%
C-2	C5	CC45CH1H220J	CC 22pF ±5%
C-2	C6	CC45CH1H220J	CC 22pF ±5%
	C7	No use	
	C8	No use	
D-3	C9	CK45B1H103K	CK 0.01μF ±10%
C-3	C10	CK45B1H103K	CK 0.01μF ±10%
B-2	C11	C91-0549-05	Tantalum 1μF 35WV
E-3	C12	CE04W1C330M	CE 33μF 16WV
E-3	C13	CE04W1C330M	CE 33μF 16WV
E-3	C14	CK45B1H103K	CK 0.01μF ±10%

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
D-2	C15	CK45B1H103K	CK	0.01µF	±10%	
C-3	C16	CK45B1H103K	CK	0.01µF	±10%	
D-3	C17	CK45B1H103K	CK	0.01µF	±10%	
B-2	C18	C91-0549-05	Tantalum	1µF		35WV
D-3	C19	CE04W1C330M	CE	33µF		16WV
E-3	C20	CE04W1C330M	CE	33µF		16WV
F-3	C21	CK45B1H103K	CK	0.01µF	±10%	
D-2	C22	CK45B1H103K	CK	0.01µF	±10%	
C-2	C23	CK45B1H103K	CK	0.01µF	±10%	
C-3	C24	CE04W1C100M	CE	10µF		16WV
E-2	TC1	C05-0412-05	TC	20pF		
E-3	L1	L40-2201-03	Ferri-inductor	22µH		
E-3	L2	L40-2201-03	Ferri-inductor	22µH		
C-3	D1		Diode	Zener	WZ-081	
C-3	Q1		TR	NPN	2SC1215 (T or S)	
C-2	Q2		FET	Dual	DN1901	
C-2	Q3		TR	NPN	2SC1215 (T or S)	
C-2	Q4		TR	NPN	2SC1215 (T or S)	
D-2	Q5		TR	PNP	2SA1161	
D-2	Q6		TR	PNP	2SA1161	
D-3	Q7		TR	NPN	2SC2499	
E-2	IC1		IC	Linear	CA3102E	
D-3	P43	E40-0276-06	Pin connector		2P	
D-3	P44	E40-0276-05	Pin connector		2P	
F-3	P45	E40-0676-05	Pin connector		6P	
C-4	P51	E40-0576-05	Pin connector		5P	

POWER BLANKING UNIT X68-1310-01

Fig. & Index No.	Ref. No.	Parts No.	Name & Description			
C-6	R1	RN14BK2B5102F	RN	51kΩ	±1%	1/8W
C-6	R2	RN14BK2B5101F	RN	5.1kΩ	±1%	1/8W
B-5	R3	RD14BB2C102J	RD	1kΩ		
	R4	No use				
B-5	R5	RD14BB2C101J	RD	100Ω		
B-5	R6	RD14BB2C102J	RD	1kΩ		
C-5	R7	RN14BK2B1303F	RN	130kΩ	±1%	1/8W
C-5	R8	RN14BK2B5601F	RN	5.6kΩ	±1%	1/8W
C-4	R9	RD14BB2C561J	RD	560Ω		
C-4	R10	RD14BB2C392J	RD	3.9kΩ		
C-4	R11	RN14BK2B5101F	RN	5.1kΩ	±1%	1/8W
C-4	R12	RN14BK2B5101F	RN	5.1kΩ	±1%	1/8W
C-4	R13	RD14BB2C561J	RD	560Ω		
C-4	R14	RD14BB2C392J	RD	3.9kΩ		
C-4	R15	RN14BK2B1301F	RN	1.3kΩ	±1%	1/8W
C-4	R16	RN14BK2B3901F	RN	3.9kΩ	±1%	1/8W
C-5	R17	RD14BB2C561J	RD	560Ω		
C-5	R18	RD14BB2C222J	RD	2.2kΩ		
B-6	R19	RD14BB2E100J	RD	10Ω	±5%	1/4W
B-6	R20	RN14BK2B1302F	RN	13kΩ	±1%	1/8W
B-6	R21	RN14BK2B8201F	RN	8.2kΩ	±1%	1/8W
	R22	No use				
	R23	No use				
	R24	No use				
	R25	No use				
D-6	R26	RD14BB2C682J	RD	6.8kΩ		
D-5	R27	RD14BB2C332J	RD	3.3kΩ		
D-6	R28	RD14BB2C332J	RD	3.3kΩ		
E-6	R29	RD14BB2C510J	RD	51Ω		
E-6	R30	RD14BB2C510J	RD	51Ω		
E-6	R31	RD14BB2C471J	RD	470Ω		
E-6	R32	RD14BB2C222J	RD	2.2kΩ		
E-5	R33	RD14BB2C222J	RD	2.2kΩ		
E-5	R34	RD14BB2C471J	RD	470Ω		
F-6	R35	RD14BB2C332J	RD	3.3kΩ		
F-6	R36	RD14BB2C102J	RD	1kΩ		
F-6	R37	RD14BB2C102J	RD	1kΩ		
E-5	R38	RD14BB2C332J	RD	.3k0Ω		
E-5	R39	RD14BB2C122J	RD	1.2kΩ		
E-5	R40	RD14BB2E101J	RD	100Ω	±5%	1/4W
E-4	R41	RD14BB2C221J	RD	220Ω		
E-4	R42	RD14BB2C332J	RD	33kΩ		
D-4	R43	RD14BB2C432J	RD	4.3kΩ		
D-4	R44	RD14BB2C471J	RD	470Ω		
E-4	R45	RD14BB2C753J	RD	75kΩ		
D-4	R46	RD14BB2C124J	RD	120kΩ		
D-4	R47	RD14BB2C562J	RD	5.6kΩ		
D-4	R48	RD14BB2C561J	RD	560Ω		
E-3	R49	RD14BB2C470J	RD	47Ω		
E-4	R50	RD14BB2C104J	RD	100kΩ		
E-5	R51	RD14BB2C221J	RD	220Ω		
E-5	R52	RD14BB2C562J	RD	5.6kΩ		
E-4	R53	RD14BB2C154J	RD	150kΩ		
E-4	R54	RD14BB2C124J	RD	120kΩ		
E-3	R55	RD14BB2C470J	RD	47Ω		
E-4	R56	RD14BB2C332J	RD	3.3kΩ		
E-3	R57	RD14BB2C561J	RD	560Ω		
C-3	R58	RD14BB2C683J	RD	68kΩ		
C-3	R59	RD14BB2C683J	RD	68kΩ		
C-3	R60	RD14BB2C102J	RD	1kΩ		
C-3	R61	RD14BB2C102J	RD	1kΩ		
C-3	R62	RD14BB2C103J	RD	10kΩ		
C-4	R63	RD14BB2C102J	RD	1kΩ		
C-2	R64	RD14BB2C683J	RD	68kΩ		
B-2	R65	RD14BB2C103J	RD	10kΩ		

PARTS LIST

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description
B-2	R66	RD14BB2C103J	RD 10kΩ
C-2	R67	RD14BB2C102J	RD 1kΩ
B-2	R68	RD14BB2C472J	RD 4.7kΩ
B-1	R69	RD14BB2C330J	RD 33Ω
D-3	R70	R92-0793-05	MG 15MΩ ±5% 1/2W
F-2	R71	RC05GF2H825J	RC 8.2MΩ ±5% 1/2W
F-2	R72	RC05GF2H156J	RC 15MΩ ±5% 1/2W
E-2	R73	R92-0755-05	MG 3MΩ ±5% 1/2W
E-2	R74	R92-0756-05	MG 47MΩ ±5% 1/2W
A-4	R75	RD14BB2C562J	RD 5.6kΩ
	R76	No use	
	R77	No use	
B-3	R78	RD14BB2E101J	RD 100Ω ±5% 1/4W
	R79	No use	
F-5	R80	RD14BB2C221J	RD 220Ω
C-3	R81	RD14BB2C102J	RD 1kΩ
	R82	RD14BB2C102J	RD 1kΩ
	R83	RN14BK2B2200F	RN 220Ω ±1% 1/8W
	R84	RN14BK2B5101F	RN 5.1kΩ ±1% 1/8W
F-5	VR1	R03-3502-15	VR 10kΩ
C-3	VR2	R12-3041-05	VR 10kΩ
C-3	VR3	R12-3041-05	VR 10kΩ
G-3	VR4	R23-1501-05	VR 1kΩ
D-5	VR5	R12-1028-05	VR 4.7kΩ
E-6	VR6	R12-3041-05	VR 10kΩ
C-2	VR7	R12-3042-05	VR 47kΩ
G-2	VR8	R05-8001-05	VR 3MΩ
A-4	VR9	R12-5501-05	VR 150kΩ
C-6	C1	CK45B1H103K	CK 0.01μF ±10%
B-5	C2	CE04W1V100M	CE 10μF 35WV
C-6	C3	CE04W1J330M	CE 33μF 63WV
B-5	C4	CE04W2C3R3M	CE 3.3μF 160WV
C-5	C5	CE04W2C3R3M	CE 3.3μF 160WV
C-4	C6	CE04W1C330M	CE 33μF 16WV
C-4	C7	C91-0549-05	Tantalum 1μF 35WV
C-4	C8	CE04W1E101M	CE 100μF 25WV
C-4	C9	CE04W1E101M	CE 100μF 25WV
C-5	C10	CE04W1A221M	CE 220μF 10WV
B-6	C11	CE04W1V100M	CE 10μF 35WV
B-6	C12	CK45B1H103K	CK 0.01μF ±10%
C-5	C13	CE04W1V470M	CE 47μF 35WV
B-3	C14	CK45B1H103K	CK 0.01μF ±10%
B-3	C15	CK45B1H103K	CK 0.01μF ±10%
	C16	No use	
E-6	C17	CC45CH1H680J	CC 68pF ±5%
F-6	C18	CC45CH1H680J	CC 68pF ±5%
E-5	C19	CK45B1H472K	CK 4700pF ±10%
E-5	C20	CK45B1H472K	CK 4700pF ±10%
F-5	C21	C91-0549-05	Tantalum 1μF 35WV
F-5	C22	C91-0549-05	Tantalum 1μF 35WV
	C23	CC45CH1H220J	CC 22pF ±5%
E-4	C24	CC45CH2H010C	CC 1pF ±0.25pF500WV
D-4	C25	CK45B2H472K	CK 4700pF ±10% 500WV
D-4	C26	CK45B1H103K	CK 0.01μF ±10%
E-4	C27	CC45CH2H010C	CC 1pF ±0.25pF500WV
E-3	C28	CK45B2H472K	CK 4700pF ±10% 500WV
E-3	C29	CK45B1H103K	CK 0.01μF ±10%
D-4	C30	CE04W2C3R3M	CE 3.3μF 160WV
D-3	C31	CK45B2H472K	CK 4700pF ±10% 500WV
D-5	C32	CE04W1A221M	CE 220μF 10WV
D-5	C33	CK45B1H103K	CK 0.01μF ±10%
D-4	C34	CE04W1E101M	CE 100μF 25WV
D-4	C35	CK45B1H103K	CK 0.01μF ±10%

Fig. & Index No.	Ref. No.	Parts No.	Name & Description
D-3	C36	CK45E3D103P	CK 0.01μF +100%,–0% 2kWV
D-3	C37	CK45E3D103P	CK 0.01μF +100%,–0% 2kWV
E-3	C38	CK45E3D103P	CK 0.01μF +100%,–0% 2kWV
E-3	C39	CK45E3D103P	CK 0.01μF +100%,–0% 2kWV
D-2	C40	CK45B3D102K	CK 1000pF ±10% 2kWV
C-2	C41	CQ93M1H154K	CQ 0.15μF ±10%
C-2	C42	CK45B1H103K	CK 0.01μF ±10%
C-2	C43	CK45B1H472K	CK 4700pF ±10%
C-2	C44	CE04W1E470M	CE 47μF 25WV
B-2	C45	CK45B1H103K	CK 0.01μF ±10%
B-2	C46	CE04W1E470M	CE 47μF 25WV
B-2	C47	CK45B1H103K	CK 0.01μF ±10%
B-1	C48	CE04W1E470M	CE 47μF 25WV
B-2	C49	CQ93M1H472K	CQ 4700pF ±10%
C-3	C50	CE04W1E470M	CE 47μF 25WV
C-3	C51	CK45B1H472K	CK 4700pF ±10%
D-1	C52	CK45E3D103P	CK 0.01μF +100%,–0% 2kWV
F-2	C53	CK45E3D103P	CK 0.01μF +100%,–0% 2kWV
F-1	C54	CK45B3D102K	CK 1000pF ±10% 2kWV
B-3	C55	CK45B2H222K	CK 2200pF ±10% 500WV
	C56	No use	
E-6	C57	CC45CH1H101J	CC 100pF ±5%
E-5	C58	CC45CH1H101J	CC 100pF ±5%
D-6	TC1	C05-0405-05	TC 20pF
E-4	TC2	C05-0405-05	TC 20pF
E-4	TC3	C05-0403-05	TC 6pF
C-6	L1	L40-1011-04	Ferri-inductor 100μH
C-4	L2	L40-1001-01	Ferri-inductor 10μH
C-6	L3	L40-1011-04	Ferri-inductor 100μH
D-5	L4	L40-1011-04	Ferri-inductor 100μH
D-4	L5	L40-1011-04	Ferri-inductor 100μH
D-4	L6	L40-1011-04	Ferri-inductor 100μH
B-2	L7	L40-1011-04	Ferri-inductor 100μH
B-2	L8	L40-1011-04	Ferri-inductor 100μH
B-2	L9	L40-1011-04	Ferri-inductor 100μH
B-5	D1		Diode Silicon DS442X
B-4	D2		Diode Zener WZ-120
B-4	D3		Diode Zener WZ-120
E-5	D4		Diode Zener WZ-032
E-5	D5		Diode Silicon DS442X
	D6	No use	
E-5	D7		Diode Zener WZ-090
D-3	D8		Diode Silicon 1SS83
E-3	D9		Diode Silicon 1SS83
D-2	D10		Diode Silicon W06C
D-2	D11		Diode Silicon W06C
F-2	D12		Diode Silicon W06C
F-1	D13		Diode Silicon W06C
C-2	D14		Diode Silicon DS442X
C-2	D15		Diode Silicon DS442X
C-2	D16		Diode Zener WZ-032
B-2	D17		Diode Silicon DS442X
B-5	Q1		TR NPN 2SC1913 (Q or R)
B-5	Q2		TR NPN 2SC1505 (L)
C-4	Q3		TR PNP 2SB633 (E)

PARTS LIST

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Fig. & Index No.	Ref. No.	Parts No.	Name & Description
C-4	Q4		TR NPN 2SD613 (E)
C-5	Q5		TR PNP 2SB633 (E)
B-6	Q6		TR NPN 2SC1505 (L)
B-6	Q7		TR NPN 2SC536KNP (F)
B-4	Q8		TR NPN 2SC1505 (L)
B-3	Q9		TR NPN 2SC536KNP (F)
B-3	Q10		TR PNP 2SA608KNP (F)
	Q11	No use	
	Q12	No use	
E-5	Q13		TR NPN 2SC1215 (T or S)
E-5	Q14		TR NPN 2SC1215 (T or S)
E-5	Q15		TR NPN 2SC1215 (T or S)
	Q16	No use	
D-5	Q17		TR NPN 2SC1047 (C)
D-4	Q18		TR PNP 2SA838 (C)
E-3	Q19		TR NPN 2SC805A-2(2,3)
D-4	Q20		TR PNP 2SA923-2 (2, 3)
	Q21		TR NPN 2SC2910 S or T
	Q22		TR PNP 2SA1208 S or T
C-3	Q23		TR NPN 2SC2910 S or T
C-3	Q24		TR NPN 2SC2910 S or T
B-2	Q25		TR NPN 2SC536KNP (F)
C-2	Q26		TR NPN 2SC536KNP (F)
B-2	Q27		TR PNP 2SA608KNP (F)
C-2	Q28		FETN-channel 2SK19 (BL)
B-1	Q29		TR NPN 2SD613 (E)
B-4	IC1		IC Linear NJM4558D
B-5	IC2		IC Linear NJM4558D
D-6	P22	E40-0776-05	Pin connector 7P
F-5	P23a	E40-0476-05	Pin connector 4P
F-3	P23b	E40-0476-05	Pin connector 4P
C-3	P25	E40-0276-05	Pin connector 2P
F-6	P26a	E40-0576-05	Pin connector 5P
F-3	P26b	E40-0576-05	Pin connector 5P
D-5	P27	E40-0876-05	Pin connector 8P
E-6	P28	E40-0476-05	Pin connector 4P
A-2	P29	E40-0703-05	Pin connector 7P
A-5	P30	E40-0746-05	Pin connector 7P
A-3	P32	E40-0476-05	Pin connector 4P
E-1	P33	E40-0332-05	Pin connector 3P
E-6	P34	E40-0276-05	Pin connector 2P
		E31-0762-05	Lead wire with connector
		F02-0414-04	Heat sink
		F20-0516-05	Sheet (Insulator)
		F20-0623-05	Sheet (insulator)
F-3	PL1	B30-0927-05	Pilot lamp
F-3	PL2	B30-0927-05	Pilot lamp
F-3	PL3	B30-0927-05	Pilot lamp
F-3	PL4	B30-0927-05	Pilot lamp
D-2	NL1		Neon lamp NE-2B
D-2	NL2		Neon lamp NE-2B
E-2	NL3		Neon lamp NE-2B
E-2	NL4		Neon lamp NE-2B
		J30-0605-05	Spacer (For TR)

VOLTAGES AND WAVEFORMS

The voltages and waveforms are measured on each schematic diagram as follows;

TEST EQUIPEMENT

Digital multimeter	:	DL-720 (TRIO)
Oscilloscope	:	475A (TEKTRONIX)
Sine wave generator	:	SG-502 (TEKTRONIX)

CONTROL SETTINGS

A INTENSITY	Midrange
FOCUS	Midrange
AC-GND-DC	GND for voltage measurement DC for waveform measurement
⬍POSITION	Midrange
X5GAIN	OFF
VOLTS/DIV	0.2V
V. VARIABLE	CAL
CH 2 INV	OFF
V. MODE	Unless otherwise specified CH 1
COUPLING	AC
SLOPE	+
TRIG. MODE	AUTO
HOLDOFF	NORM
A SWEEP TIME/DIV	0.2ms
B SWEEP TIME/DIV	50μs
A. VARIABLE	CAL
◄► POSITION	Midrange
H. DISPLAY	A
×10 MAG	OFF

NOTE:

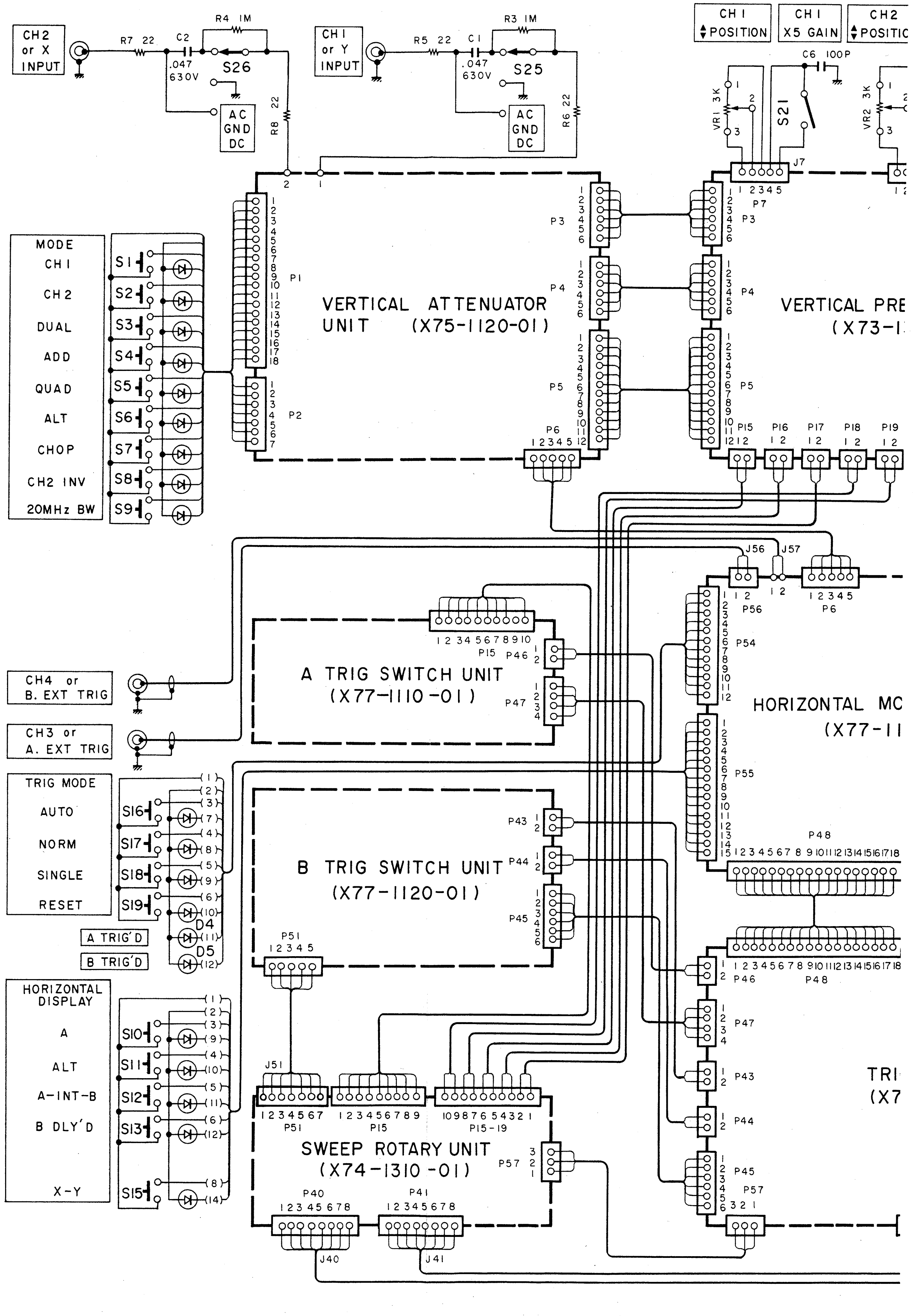
In differencial circuit, the voltages and waveforms are shown only CH 1 and CH 3.

Voltage Measurements

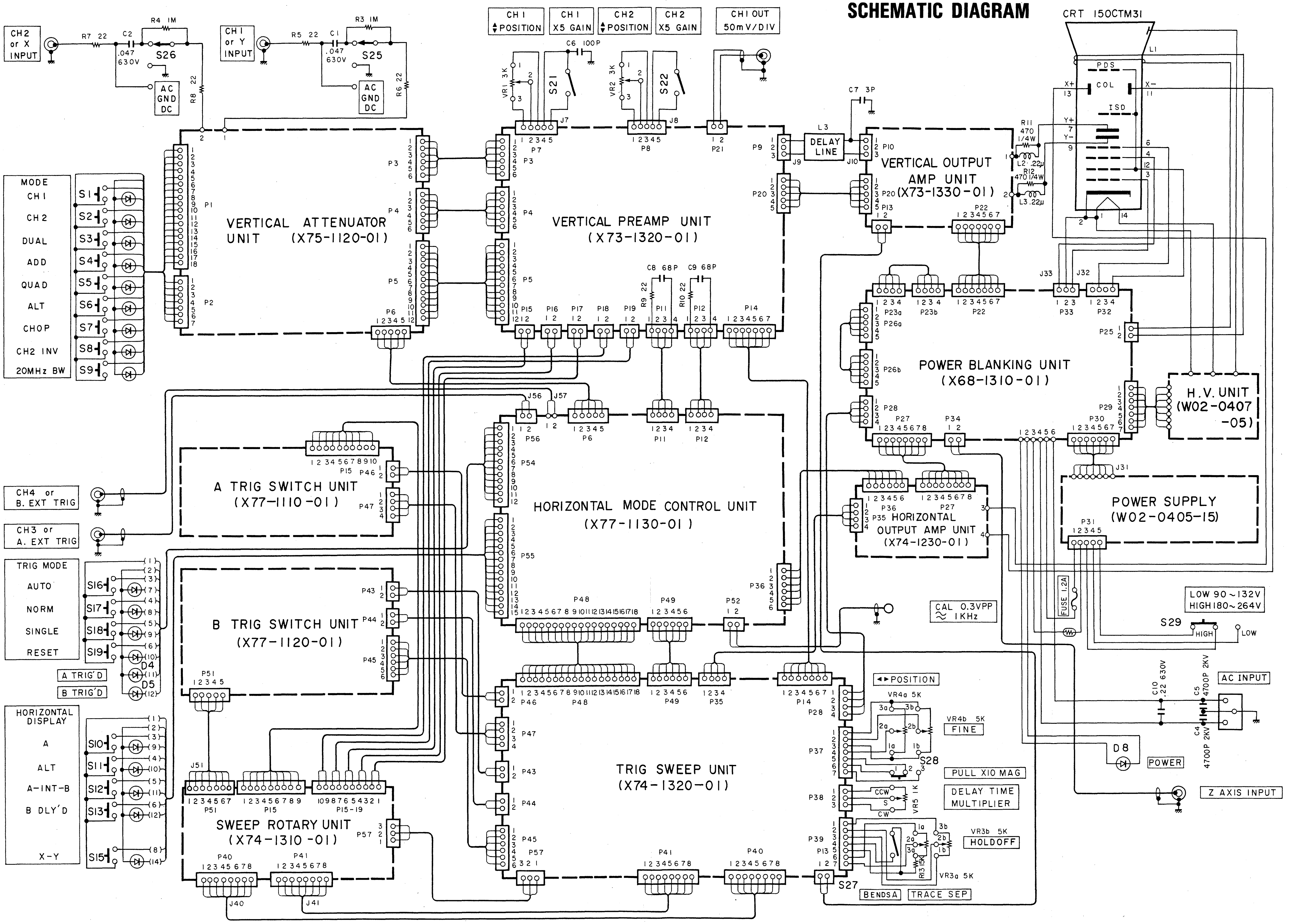
Voltage measurements are taken with no signal applied and the trace positioned to the center horizontal graticule line. The digital multimeter common should be connected to chassis ground at the nearest measurement point.

Waveform Condition

Waveforms are measured with 1 kHz 1Vp-p sine wave applied CH 1 input and 1 kHz 500m Vp-p applied CH3 input.

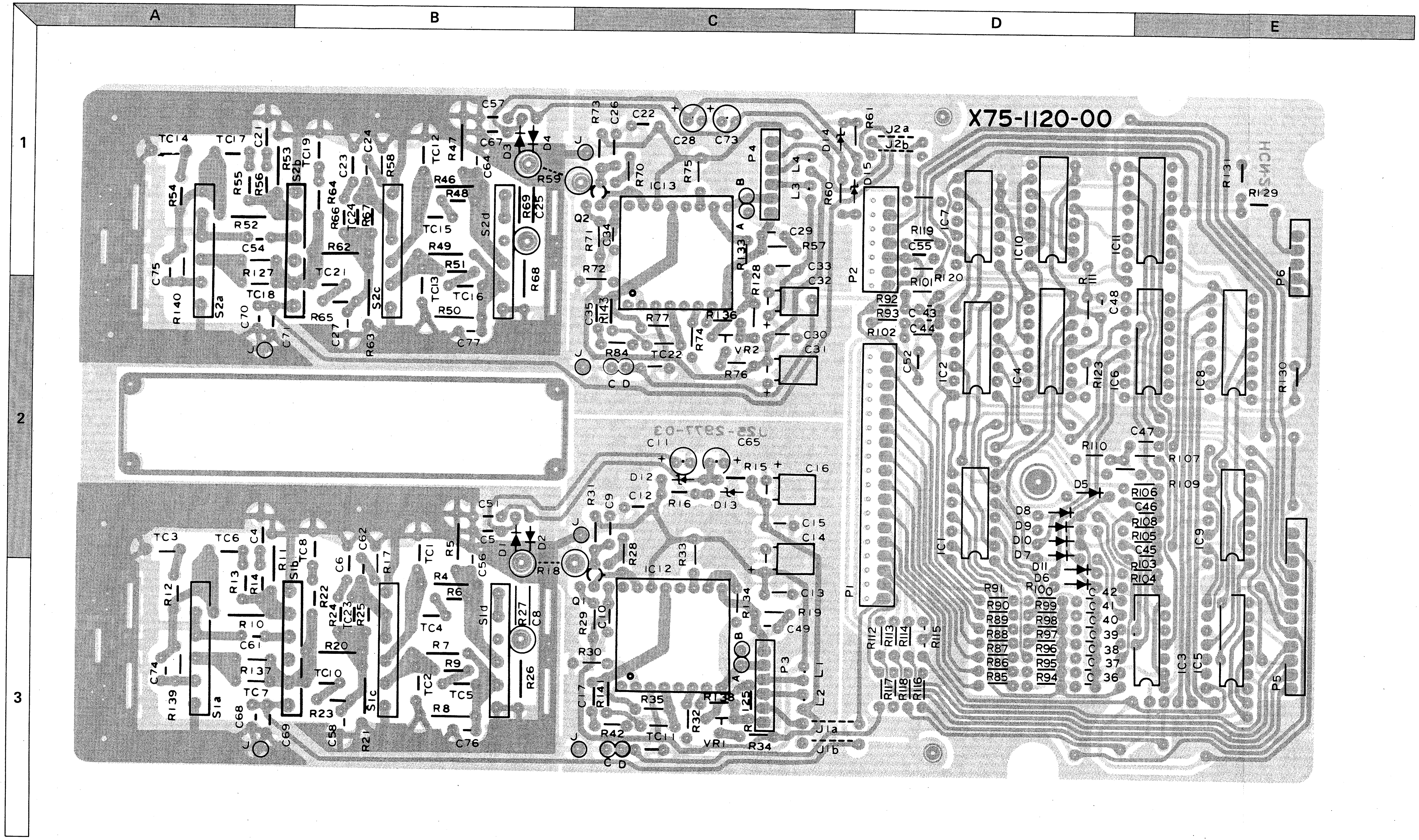

CH2 or X INPUT
CH1 or Y INPUT
R7 22
C2 .047 630V
R4 1M
S26
AC GND DC
R8 22
R5 22
C1 .047 630V
R3 1M
S25
R6 22
CH1 ⬍POSITION
CH1 X5 GAIN
CH2 ⬍POSITIC
C6 100P
VR1 3K
S21
VR2 3K
J7
P7
P1
P2
P3
P4
P5
P6
VERTICAL ATTENUATOR UNIT (X75-1120-01)
VERTICAL PRE
(X73-1
MODE
CH1
CH2
DUAL
ADD
QUAD
ALT
CHOP
CH2 INV
20MHz BW
S1
S2
S3
S4
S5
S6
S7
S8
S9
P15 P16 P17 P18 P19
J56 J57
P56
P54
P55
P48
A TRIG SWITCH UNIT (X77-1110-01)
P46
P47
CH4 or B. EXT TRIG
CH3 or A. EXT TRIG
HORIZONTAL MC
(X77-1
TRIG MODE
AUTO
NORM
SINGLE
RESET
S16
S17
S18
S19
D4
D5
A TRIG'D
B TRIG'D
B TRIG SWITCH UNIT (X77-1120-01)
P43
P44
P45
P51
HORIZONTAL DISPLAY
A
ALT
A-INT-B
B DLY'D
X-Y
S10
S11
S12
S13
S15
J51
P15-19
SWEEP ROTARY UNIT (X74-1310-01)
P57
P40
P41
J40
J41
TRI
(X7

SCHEMATIC DIAGRAM


CRT 150CTM31
CH2 or X INPUT
R7 22
C2 .047 630V
R4 1M
S26
AC GND DC
R8 22
CH1 or Y INPUT
R5 22
C1 .047 630V
R3 1M
S25
R6 22
CH1 ♦POSITION
CH1 X5 GAIN
CH2 ♦POSITION
CH2 X5 GAIN
CH1 OUT 50mV/DIV
VR1 3K
S21
C6 100P
VR2 3K
S22
C7 3P
L3 DELAY LINE
J7
J8
P7
P8
P21
P9
J9
J10
P10
P20
P13
P22
L1
PDS
COL
ISD
X+ 13
X− 11
Y+ 7
Y− 9
R11 470 1/4W
L2 .22μ
R12 470 1/4W
L3 .22μ
MODE
CH1
CH2
DUAL
ADD
QUAD
ALT
CHOP
CH2 INV
20MHz BW
S1
S2
S3
S4
S5
S6
S7
S8
S9
P1
P2
P3
P4
P5
P6
VERTICAL ATTENUATOR UNIT (X75-1120-01)
VERTICAL PREAMP UNIT (X73-1320-01)
C8 68P
C9 68P
R9 22
R10 22
P11
P12
P14
P15
P16
P17
P18
P19
VERTICAL OUTPUT AMP UNIT (X73-1330-01)
J33
J32
P23a
P23b
P33
P32
P26a
P26b
P25
P28
P27
P34
P29
P30
POWER BLANKING UNIT (X68-1310-01)
H.V. UNIT (W02-0407-05)
J31
POWER SUPPLY (W02-0405-15)
P31
HORIZONTAL OUTPUT AMP UNIT (X74-1230-01)
P36
P35
J56
J57
P56
P6
P54
P55
HORIZONTAL MODE CONTROL UNIT (X77-1130-01)
P48
P49
P52
CH4 or B. EXT TRIG
CH3 or A. EXT TRIG
A TRIG SWITCH UNIT (X77-1110-01)
P15
P46
P47
TRIG MODE
AUTO
NORM
SINGLE
RESET
S16
S17
S18
S19
D4
D5
A TRIG'D
B TRIG'D
B TRIG SWITCH UNIT (X77-1120-01)
P43
P44
P45
P51
HORIZONTAL DISPLAY
A
ALT
A-INT-B
B DLY'D
X-Y
S10
S11
S12
S13
S15
J51
SWEEP ROTARY UNIT (X74-1310-01)
P15-19
P57
P40
P41
J40
J41
TRIG SWEEP UNIT (X74-1320-01)
P46
P47
P43
P44
P45
P57
P41
P40
P14
P28
P37
P38
P39
P13
S27
CAL 0.3VPP ≈ 1KHz
FUSE 1.2A
LOW 90~132V
HIGH 180~264V
S29
HIGH
LOW
C10 .22 630V
C5 4700P 2KV
C4 4700P 2KV
AC INPUT
D8
POWER
Z AXIS INPUT
◄►POSITION
VR4a 5K
VR4b 5K
FINE
S28
PULL X10 MAG
DELAY TIME MULTIPLIER
VR5 1K
CCW
CW
VR3b 5K
HOLDOFF
VR3a 5K
R13 15K
BENDSA
TRACE SEP

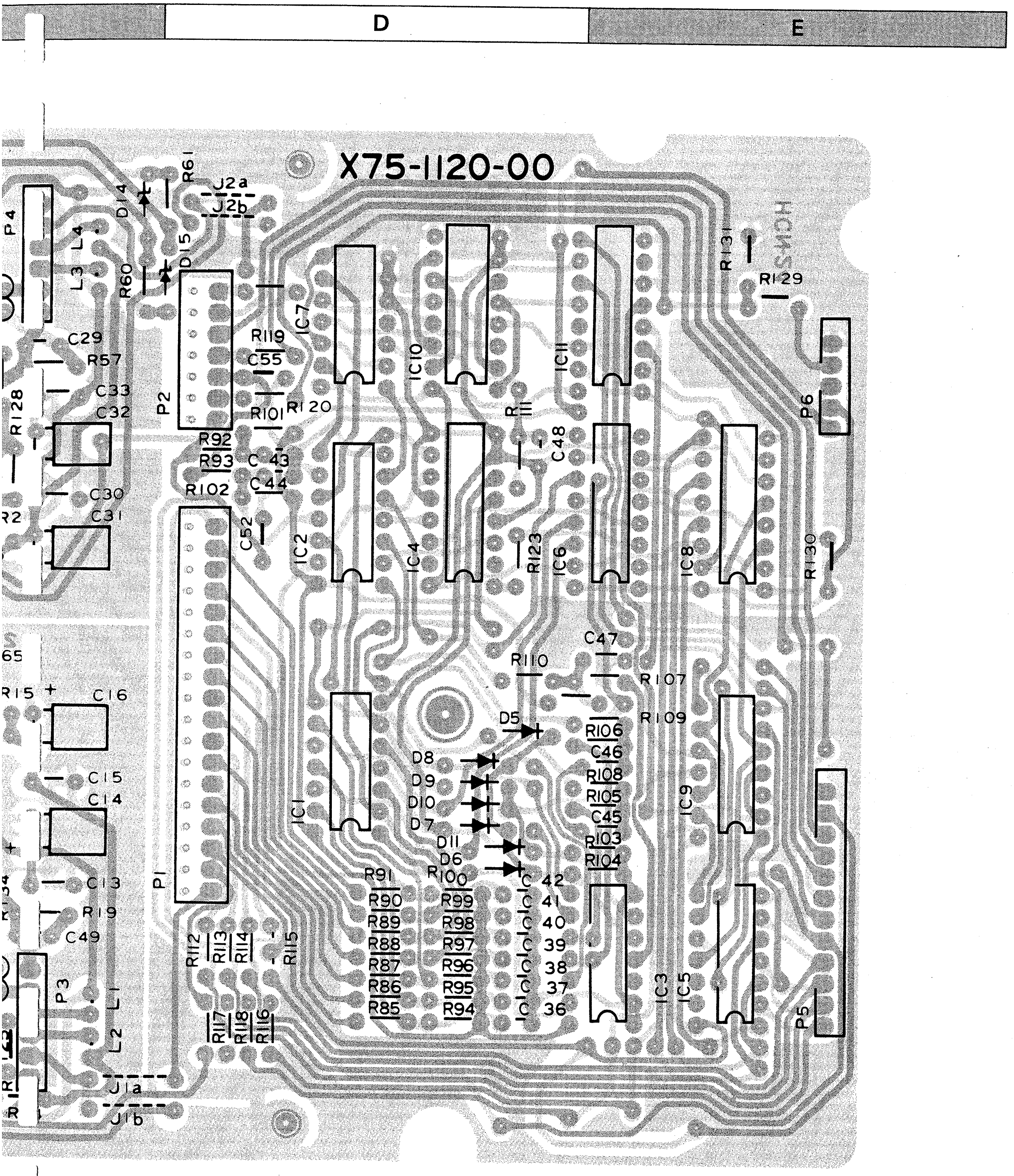
PC BOARD

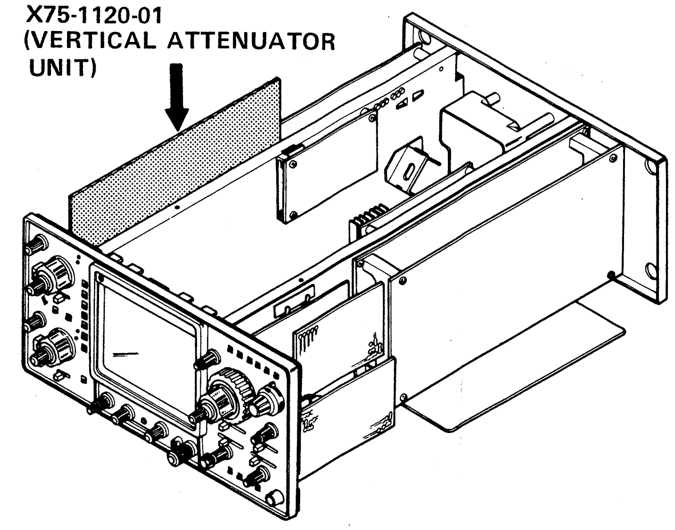
X75-1120-01

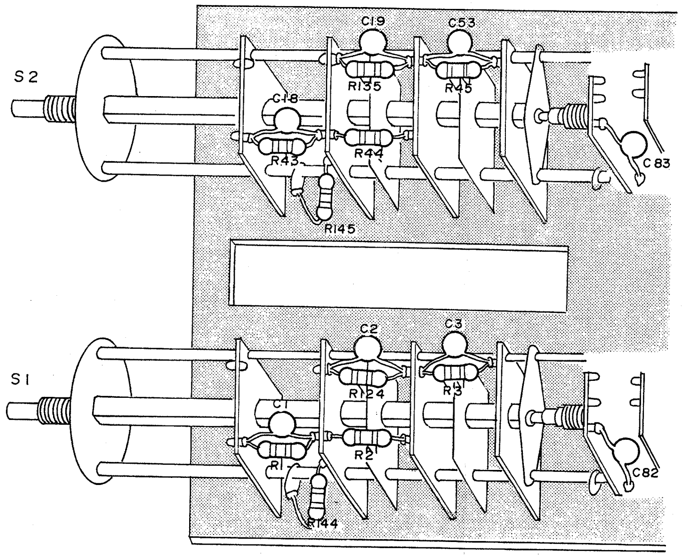


A
B
C
D
E
1
2
3
X75-1120-00
J25-2977-03
TC14
TC17
C21
R53
S2b
TC19
C23
C24
R58
TC12
R47
C57
C67
C64
D3
D4
R59
R73
C26
C22
C28
C73
P4
L4
L3
D14
R61
J2a
J2b
D15
R60
R54
R55
R56
R64
R66
TC24
R67
R46
R48
R69
C25
S2d
R70
IC13
R75
Q2
R71
C34
R52
C54
R62
TC15
R49
R51
R68
R72
R133
R128
C29
R57
C33
C32
R127
TC21
TC13
TC16
R50
C75
R140
S2a
TC18
R65
C27
S2c
R63
C70
C71
C77
C35
R143
R77
R136
R74
VR2
C30
C31
R76
R84
TC22
P2
R119
C55
IC7
R101
R120
R92
R93
C43
C44
R102
C52
IC10
IC11
R111
C48
IC2
IC4
R123
IC6
IC8
R131
R129
P6
R130
C11
C65
R15
C16
D12
C12
R16
D13
C15
C14
C13
R19
C49
C51
R31
C9
TC3
TC6
C4
R11
TC8
C62
C6
R17
TC1
R5
C5
D1
D2
C56
R18
R28
R33
IC12
R12
R13
R14
S1b
R22
R24
TC23
R25
R4
R6
S1d
R27
C8
R29
C10
Q1
R134
R10
C61
R20
TC4
R7
R9
R30
C74
R137
TC10
S1c
TC2
TC5
R26
R139
S1a
TC7
C68
C69
R23
C58
R21
R8
C76
C17
R141
R35
R32
R138
TC11
VR1
R34
R42
P3
L1
L2
J1a
J1b
P1
R112
R113
R114
R115
R117
R118
R116
R110
C47
R107
R109
D5
R106
C46
R108
R105
C45
R103
R104
D8
D9
D10
D7
D11
D6
R100
IC1
R91
R90
R89
R88
R87
R86
R85
R99
R98
R97
R96
R95
R94
42
41
40
39
38
37
36
IC9
IC3
IC5
P5
A
B
C
D
J

OARD

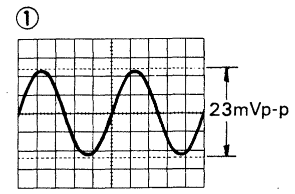

D
E
X75-1120-00
HC14S
P4
L3
L4
D14
R61
J2a
J2b
D15
R60
C29
R57
R128
C33
C32
C30
C31
R2
P2
R119
C55
IC7
R101
R120
R92
R93
C43
C44
R102
C52
IC2
IC10
IC11
R111
C48
IC4
R123
IC6
IC8
R131
R129
R130
P6
C47
R110
R107
R109
D5
R106
C46
R108
R105
C45
R103
R104
D8
D9
D10
D7
D11
D6
R100
IC1
IC9
P1
R15
C16
C15
C14
C13
R19
C49
65
R91
R90
R89
R88
R87
R86
R85
R99
R98
R97
R96
R95
R94
42
41
40
39
38
37
36
IC3
IC5
P5
R112
R113
R114
R115
R117
R118
R116
P3
L1
L2
J1a
J1b


X75-1120-01
(VERTICAL ATTENUATOR
UNIT)


S2
C19
C53
R135
R45
C18
R43
R44
R145
C83
C2
C3
S1
R124
R3
C1
R1
R2
R144
C82

Location of Parts in the Rotary Switch

WAVEFORMS



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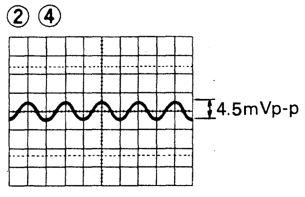
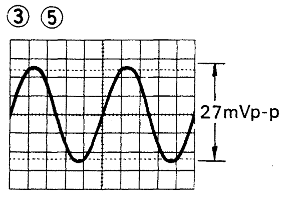


② ④



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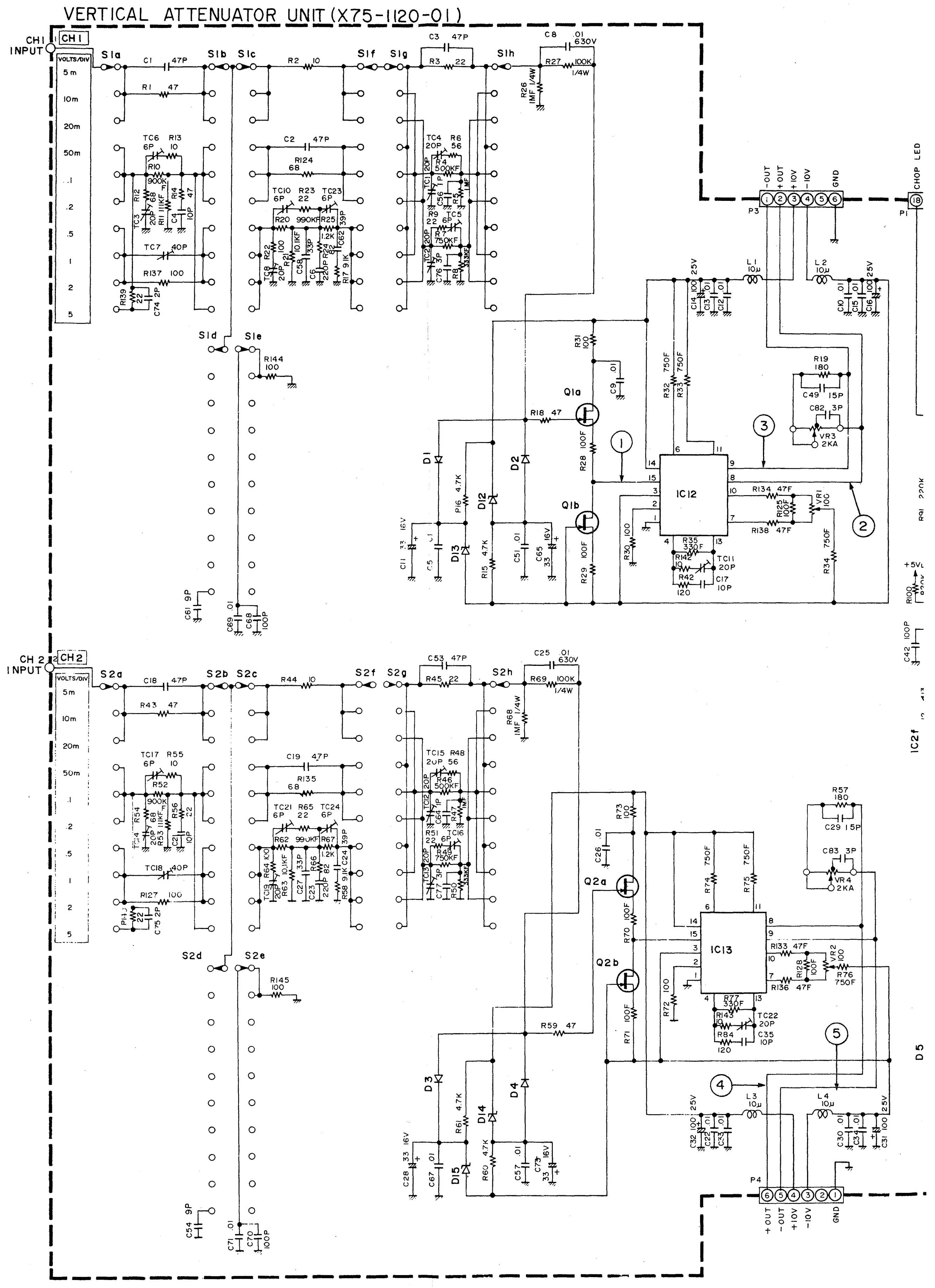
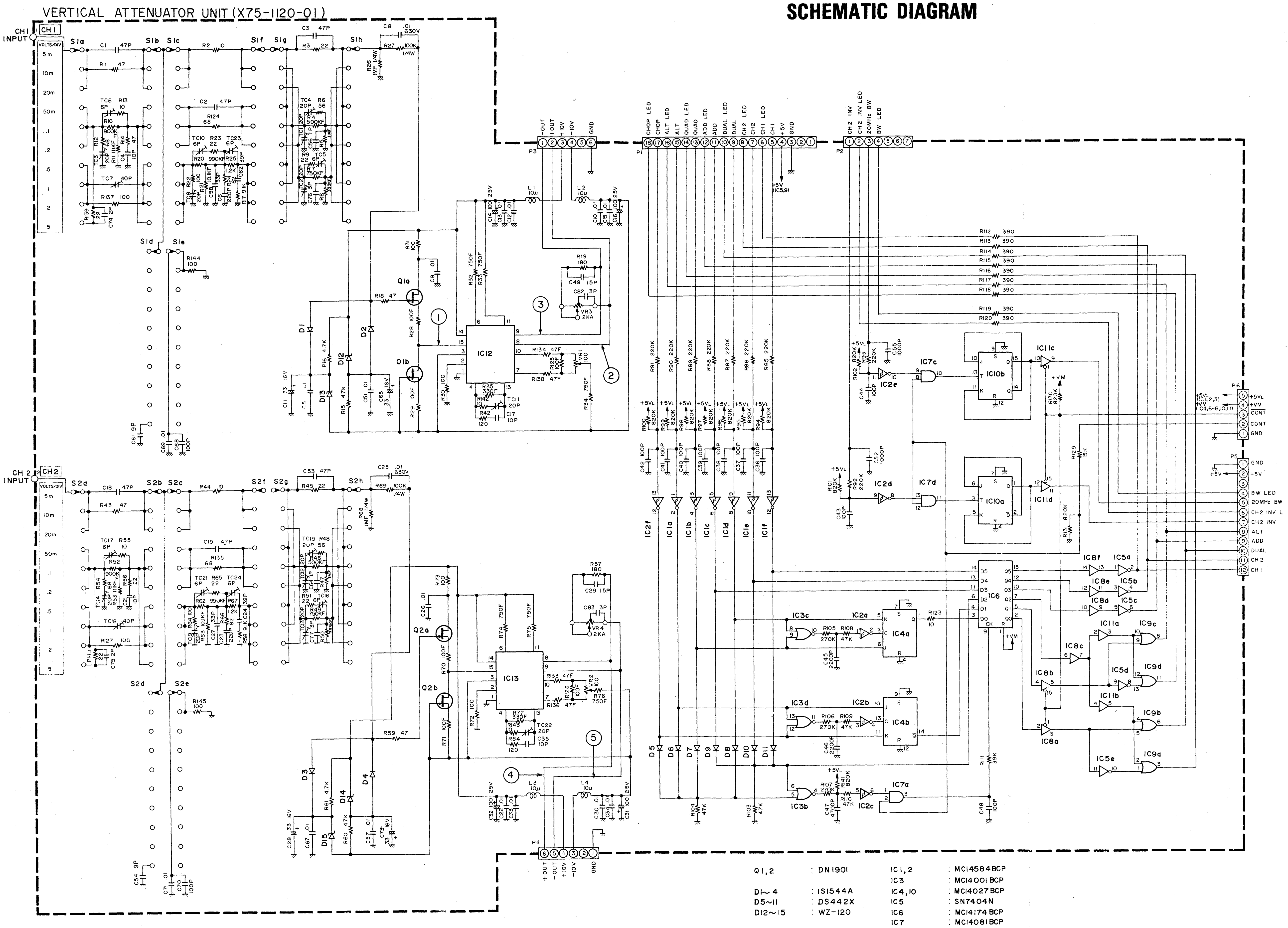


VERTICAL ATTENUATOR UNIT (X75-1120-01)

CH1 INPUT
CH1
VOLTS/DIV
5m
10m
20m
50m
.1
.2
.5
1
2
5
S1a
S1b
S1c
S1d
S1e
S1f
S1g
S1h
CH 2 INPUT
CH2
S2a
S2b
S2c
S2d
S2e
S2f
S2g
S2h
Q1a
Q1b
Q2a
Q2b
IC12
IC13
D1
D2
D3
D4
D12
D13
D14
D15
VR1 100
VR2 100
VR3 2KA
VR4 2KA
L1 10μ
L2 10μ
L3 10μ
L4 10μ
P3
P4
P1
CHOP LED
-OUT
+OUT
+10V
-10V
GND
①
②
③
④
⑤
+5V
IC2f
D5

SCHEMATIC DIAGRAM


VERTICAL ATTENUATOR UNIT (X75-1120-01)
CH1 INPUT
CH1
VOLTS/DIV
5m
10m
20m
50m
.1
.2
.5
1
2
5
CH 2 INPUT
CH2
S1a
S1b
S1c
S1d
S1e
S1f
S1g
S1h
S2a
S2b
S2c
S2d
S2e
S2f
S2g
S2h
Q1a
Q1b
Q2a
Q2b
IC12
IC13
P1
P2
P3
P4
P5
P6
-OUT
+OUT
+10V
-10V
GND
CHOP LED
CHOP
ALT LED
ALT
QUAD LED
QUAD
ADD LED
ADD
DUAL LED
DUAL
CH2 LED
CH2
CH1 LED
CH1
+5V
CH2 INV
CH2 INV LED
20MHz BW
BW LED
+5VL
+VM
CONT
BW LED
20MHz BW
CH2 INV L
CH2 INV
IC1a
IC1b
IC1c
IC1d
IC1e
IC1f
IC2a
IC2b
IC2c
IC2d
IC2e
IC2f
IC3b
IC3c
IC3d
IC4a
IC4b
IC5a
IC5b
IC5c
IC5d
IC5e
IC6
IC7a
IC7c
IC7d
IC8a
IC8b
IC8c
IC8d
IC8e
IC8f
IC9a
IC9b
IC9c
IC9d
IC10a
IC10b
IC11a
IC11b
IC11c
IC11d
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
①
②
③
④
⑤

Q1,2 : DN1901

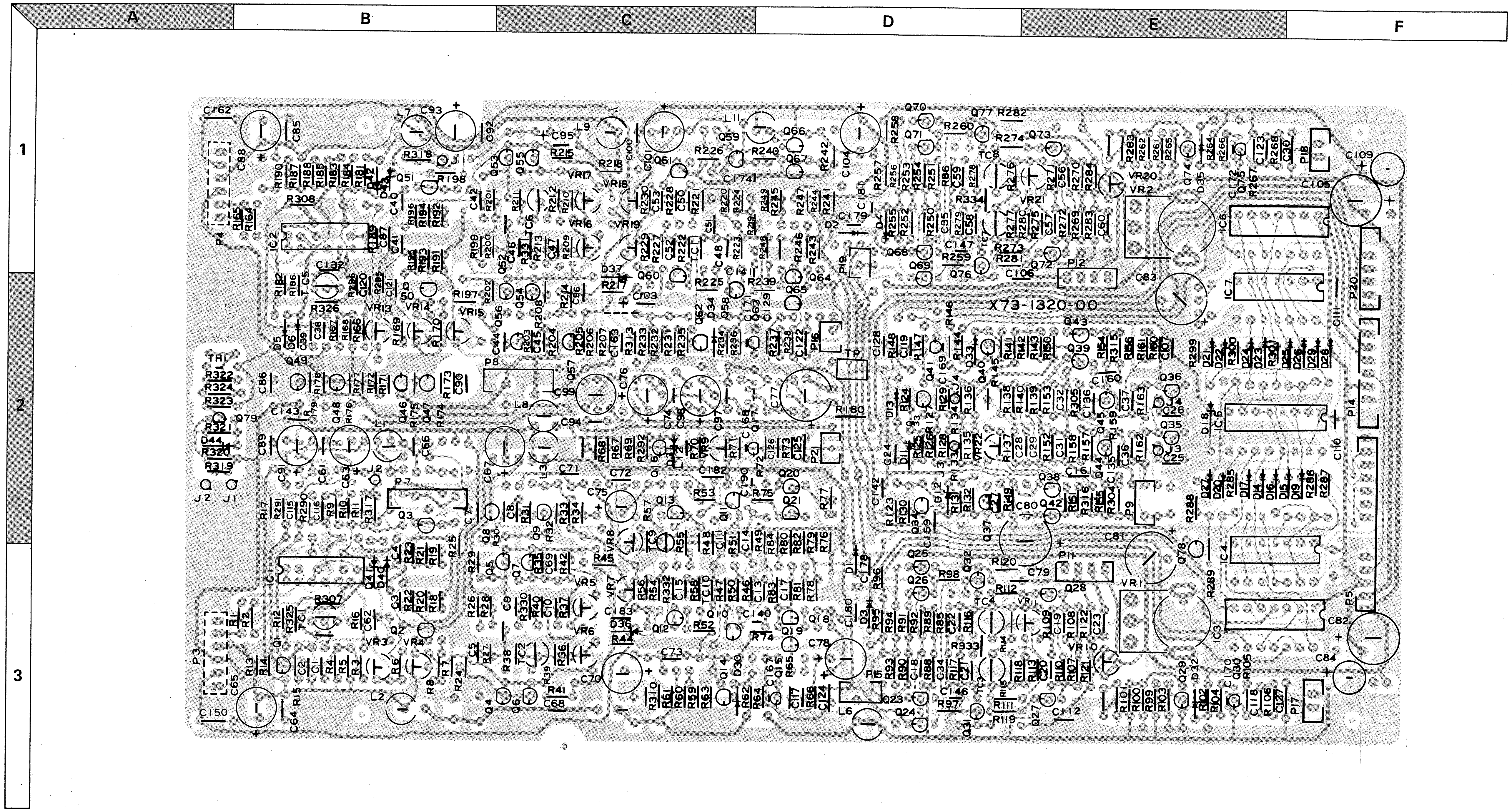
D1~4 : 1S1544A
D5~11 : DS442X
D12~15 : WZ-120

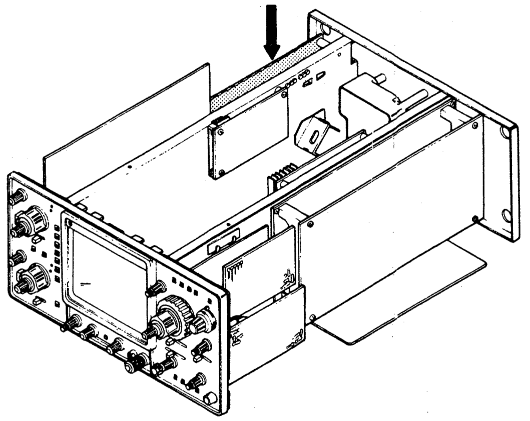
IC1,2 : MC14584BCP
IC3 : MC14001BCP
IC4,10 : MC14027BCP
IC5 : SN7404N
IC6 : MC14174BCP
IC7 : MC14081BCP
IC8,11 : MC14503BCP
IC9 : SN7432N
IC12,13 : ATM-4010

PC BOARD

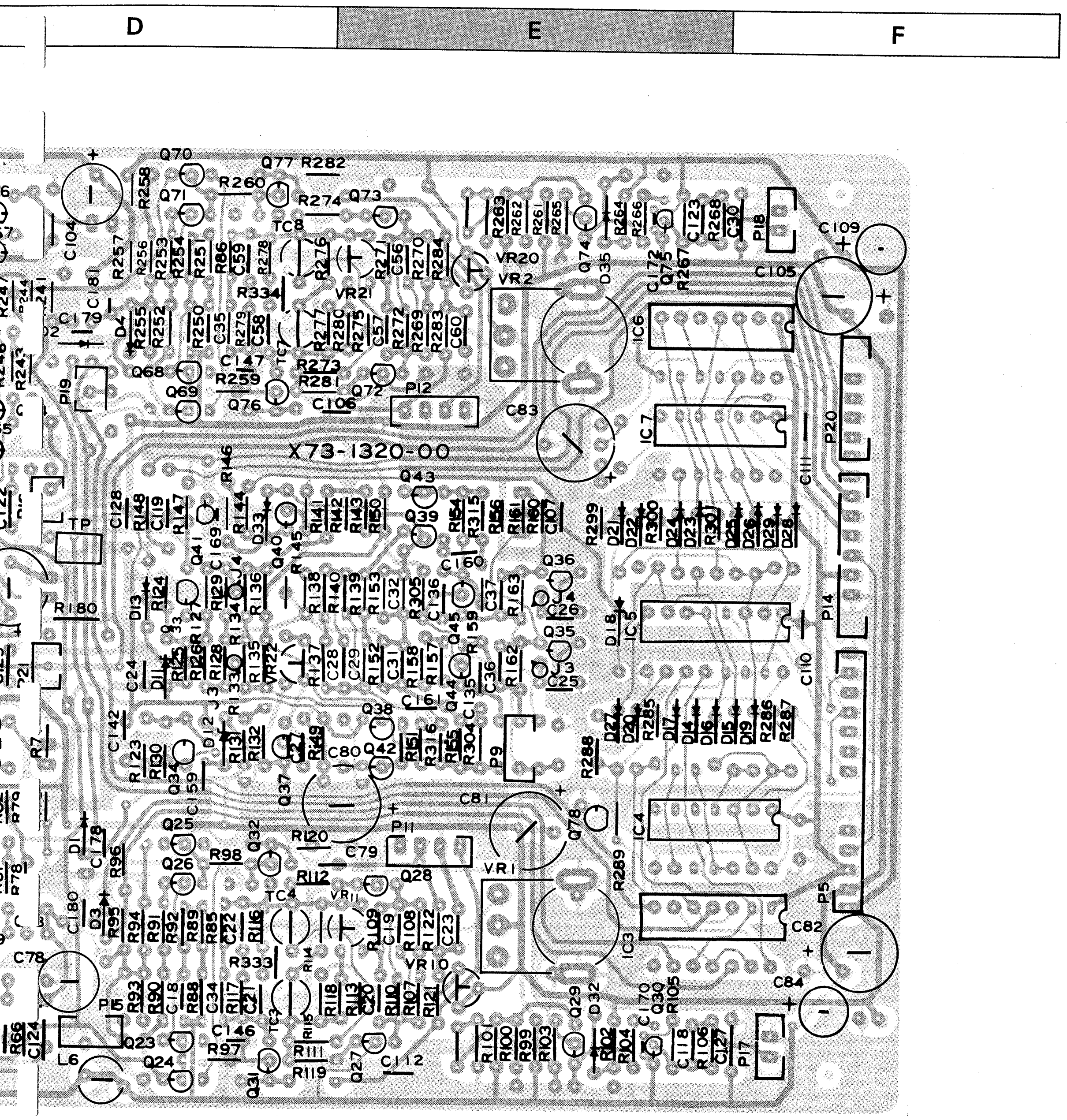
X73-1320-01

X73-132

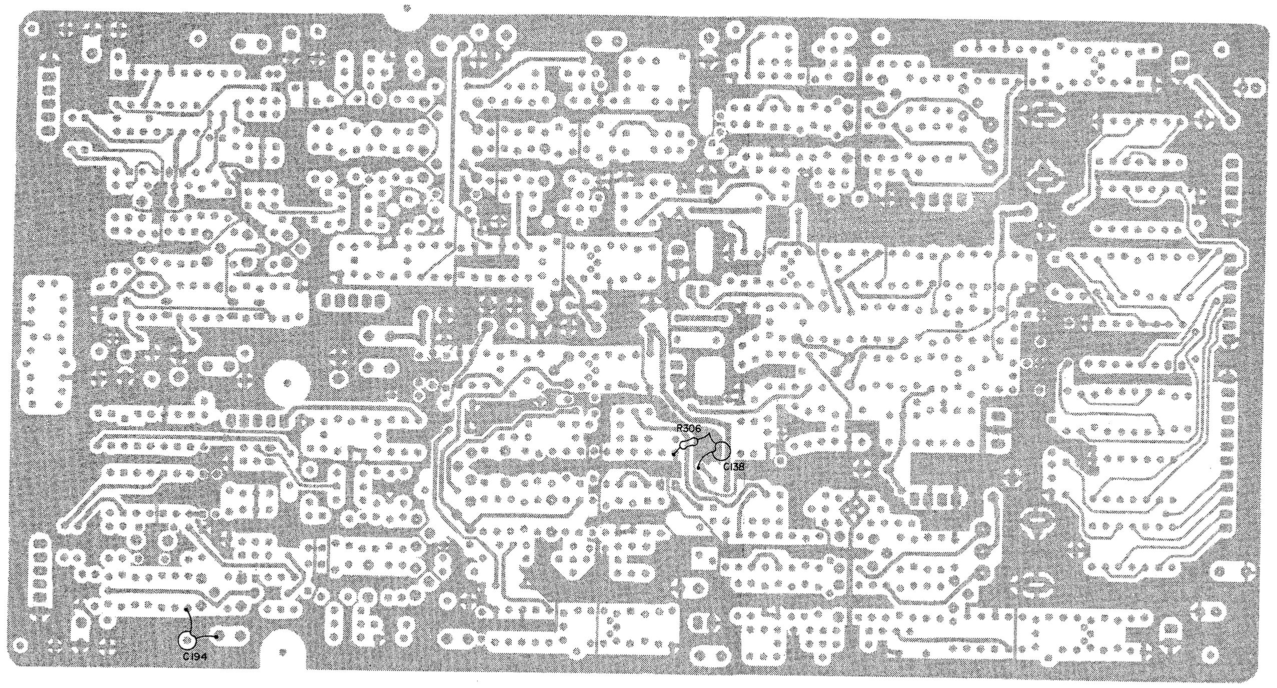

A
B
C
D
E
F
1
2
3
X73-1320-00


X73-1320-01
(V. PRE AMP UNIT)

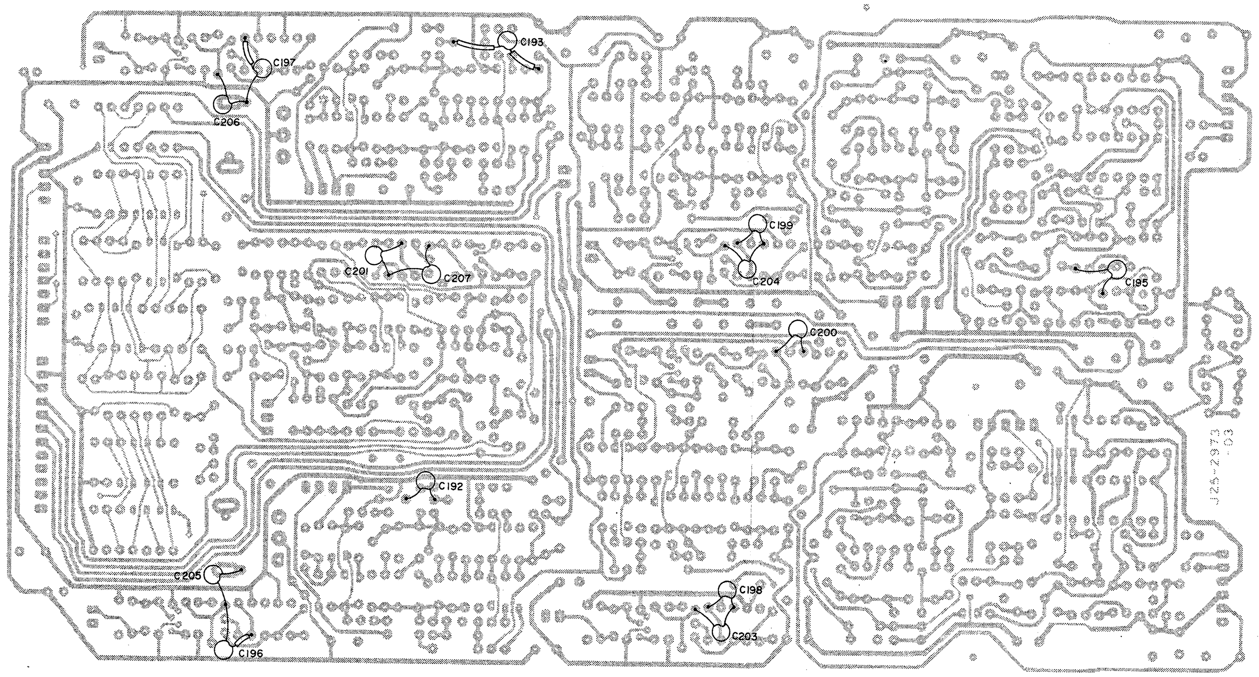
BOARD


D
E
F
X73-1320-00
Q70
Q77 R282
R260
Q71
R274 Q73
TC8
VR20
VR2
VR21
Q74
D35
IC6
IC7
C109
C105
C83
P12
P18
P20
P14
C111
C110
IC5
IC4
IC3
TP
VR1
VR10
C81
C82
C84
P5
P9
P11
P15
P17
P19
L6
C78
Q78
Q28
R333
R334
R180

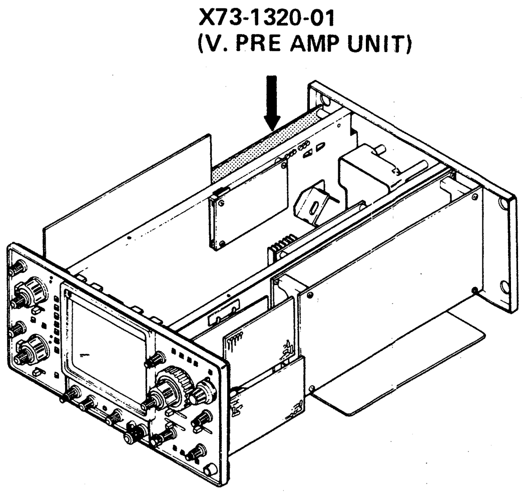
X73-1320-01


R306
C138
C194

(Parts Side View)

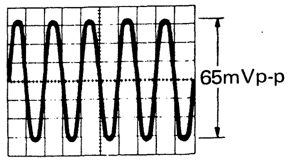

C197
C193
C206
C199
C201
C207
C204
C195
C200
C192
C205
C198
C203
C196
J25-2973-03

(Foil Side View)


X73-1320-01
(V. PRE AMP UNIT)

WAVEFORMS

①



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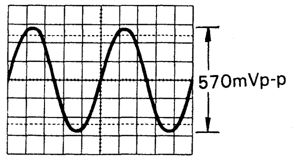

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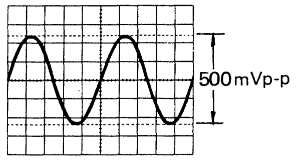

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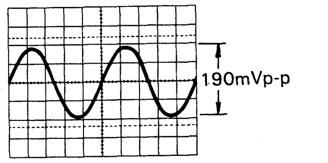

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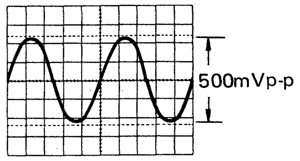

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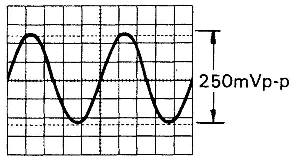

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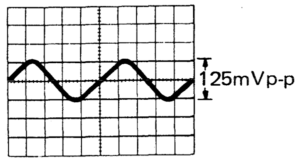

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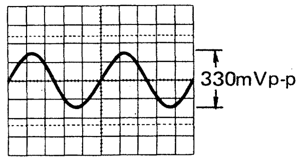

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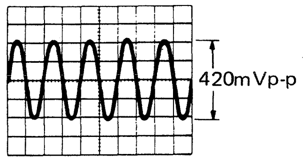

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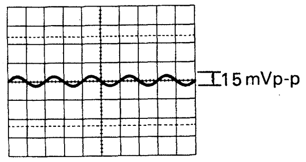

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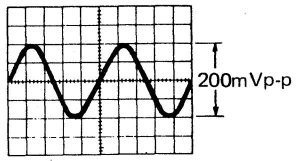

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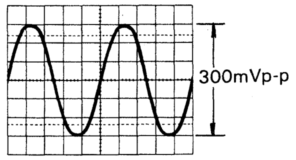

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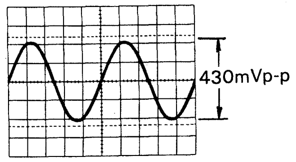
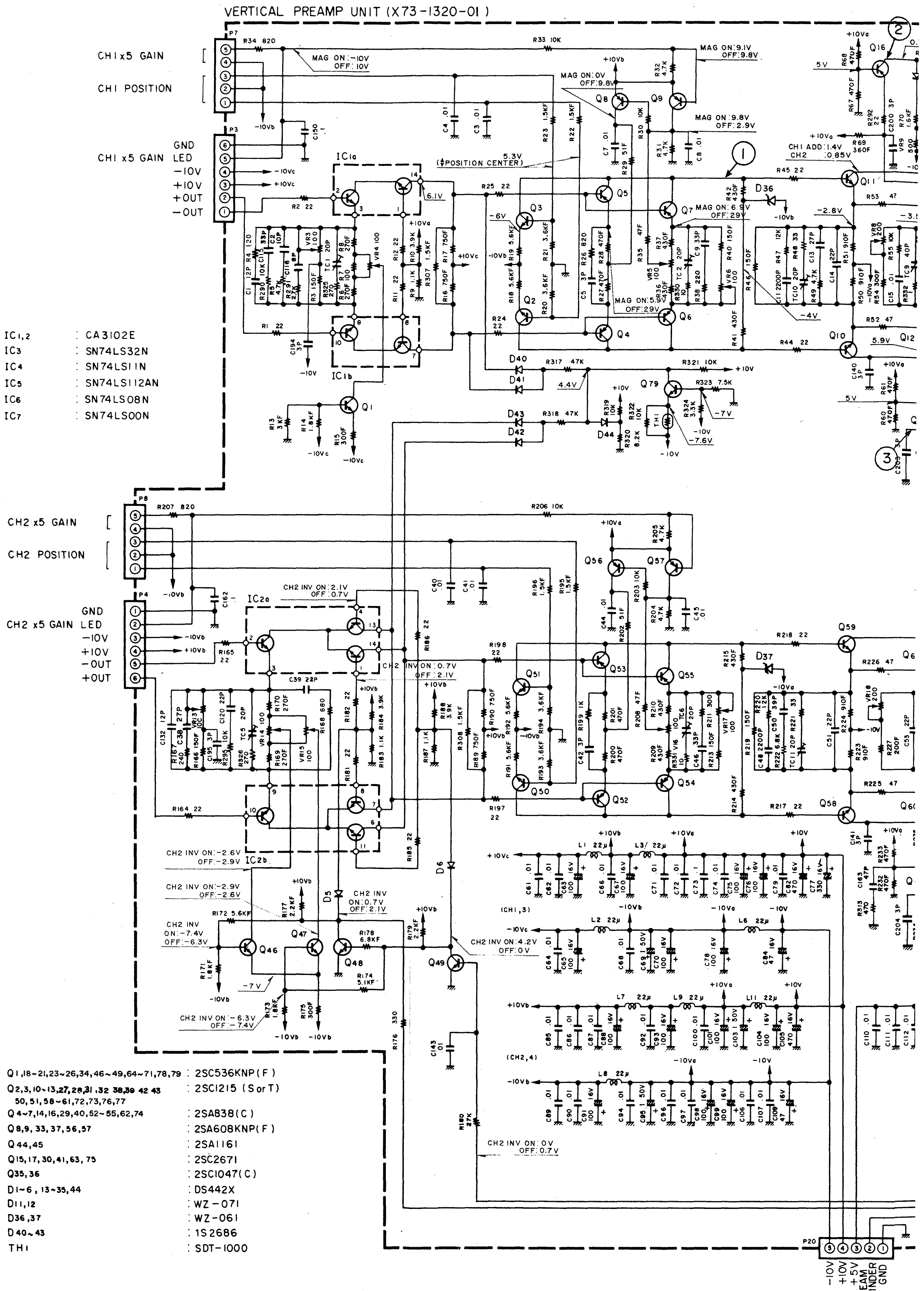


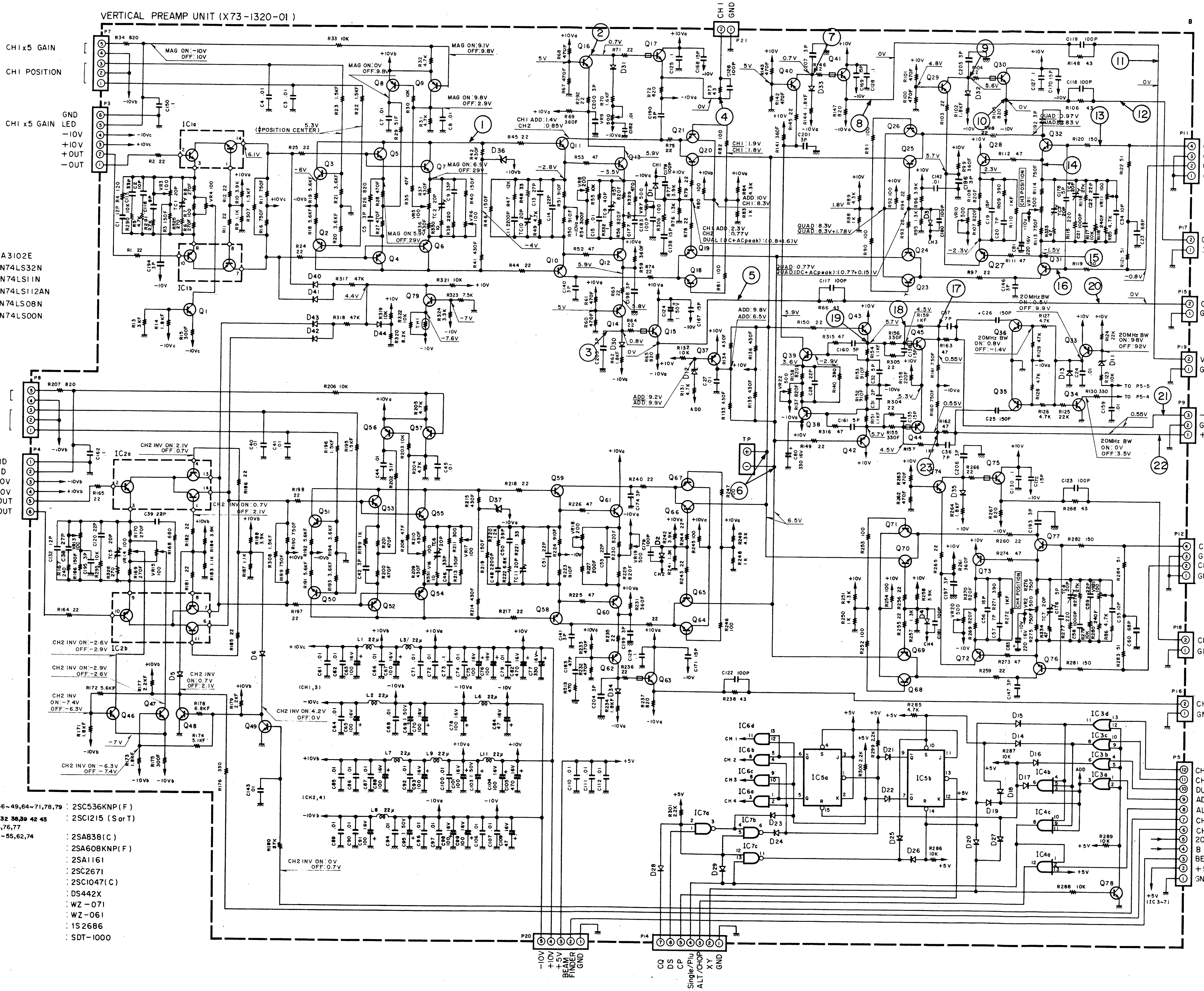
SCHEMATIC D


VERTICAL PREAMP UNIT (X73-1320-01)
CH1 x5 GAIN
CH1 POSITION
GND
CH1 x5 GAIN LED
-10V
+10V
+OUT
-OUT
CH2 x5 GAIN
CH2 POSITION
GND
CH2 x5 GAIN LED
-10V
+10V
-OUT
+OUT
MAG ON: -10V
OFF: 10V
MAG ON: 9.1V
OFF: 9.8V
MAG ON: 0V
OFF: 9.8V
MAG ON: 9.8V
OFF: 2.9V
MAG ON: 6.9V
OFF: 29V
MAG ON: 5.9V
OFF: 29V
5.3V
(POSITION CENTER)
CH1 ADD: 1.4V
CH2 : 0.85V
CH2 INV ON: 2.1V
OFF: 0.7V
CH2 INV ON: 0.7V
OFF: 2.1V
CH2 INV ON: -2.6V
OFF: -2.9V
CH2 INV ON: -2.9V
OFF: -2.6V
CH2 INV ON: 0.7V
OFF: 2.1V
CH2 INV ON: -7.4V
OFF: -6.3V
CH2 INV ON: -6.3V
OFF: -7.4V
CH2 INV ON: 4.2V
OFF: 0V
CH2 INV ON: 0V
OFF: 0.7V
IC1a
IC1b
IC2a
IC2b
TH1
P3
P4
P7
P8
P20
-10V
+10V
+5V
BEAM FINDER
GND

IC1,2	:	CA3102E
IC3	:	SN74LS32N
IC4	:	SN74LS11N
IC5	:	SN74LS112AN
IC6	:	SN74LS08N
IC7	:	SN74LS00N

Q1,18~21,23~26,34,46~49,64~71,78,79	:	2SC536KNP(F)
Q2,3,10~13,27,28,31,32 38,39 42 43 50,51,58~61,72,73,76,77	:	2SC1215 (S or T)
Q4~7,14,16,29,40,52~55,62,74	:	2SA838(C)
Q8,9, 33, 37, 56, 57	:	2SA608KNP(F)
Q44,45	:	2SA1161
Q15, 17, 30, 41, 63, 75	:	2SC2671
Q35, 36	:	2SC1047(C)
D1~6, 13~35, 44	:	DS442X
D11,12	:	WZ-071
D36,37	:	WZ-061
D40~43	:	1S2686
TH1	:	SDT-1000

SCHEMATIC DIAGRAM

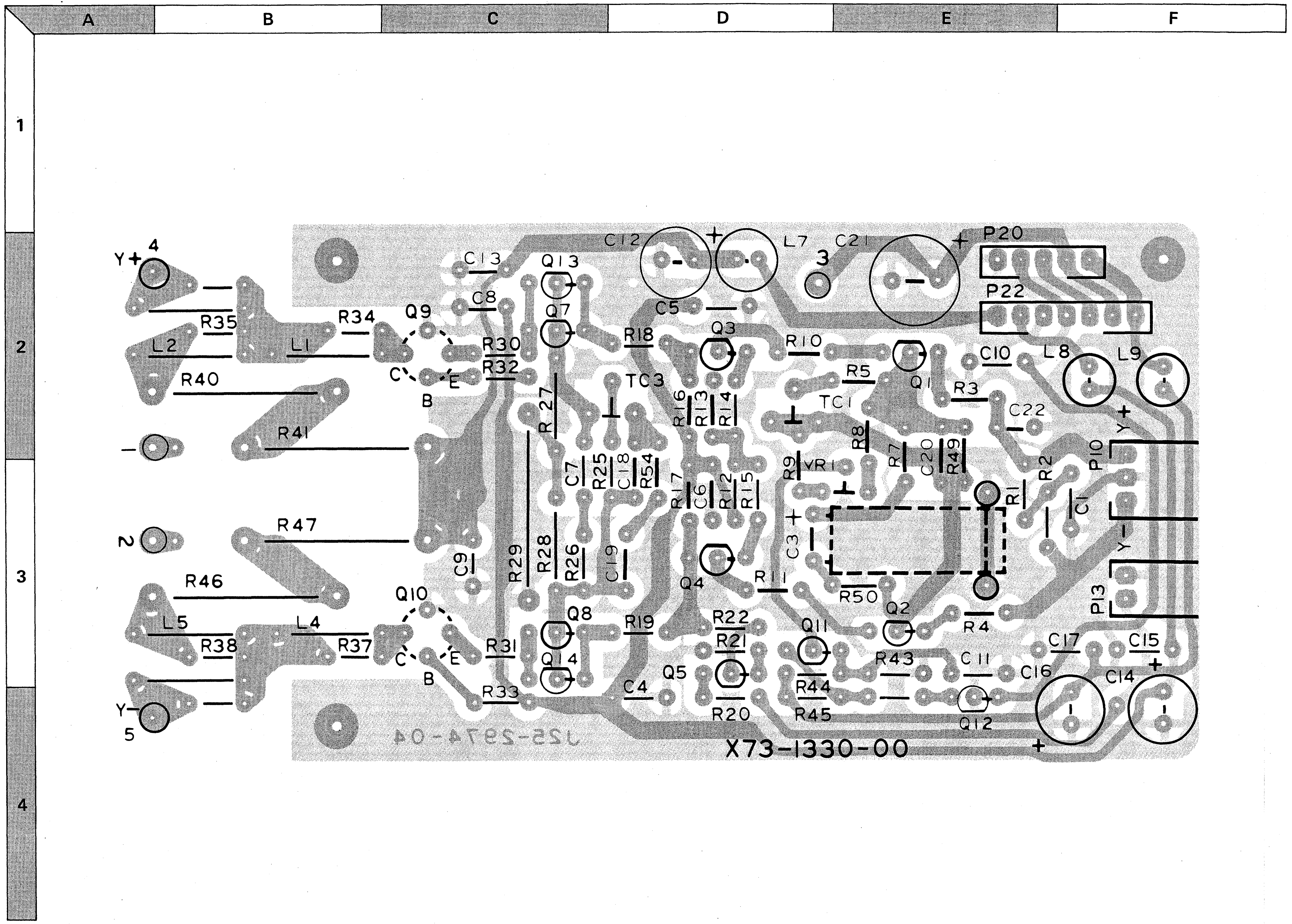

VERTICAL PREAMP UNIT (X73-1320-01)
CH1 OUT
GND
CH1 x5 GAIN
CH1 POSITION
GND
CH1 x5 GAIN LED
-10V
+10V
+OUT
-OUT
CH2 x5 GAIN
CH2 POSITION
GND
CH2 x5 GAIN LED
-10V
+10V
-OUT
+OUT
CH3 -OUT
GND
CH3 +OUT
GND
CH3
GND
CH1
GND
V, MODE
GND
-OUT
GND
+OUT
CH4 -OUT
GND
CH4 +OUT
GND
CH4
GND
CH2
GND
CH1
CH2
DUAL
ADD
ALT
CH2 INV
CH2 INV LED
20MHz B W
B W LED
BEAM FINDER
+5V
GND
-10V
+10V
+5V
BEAM FINDER
GND
CQ
DS
CP
Single/Plu
ALT/CHOP
XY
GND
TP

IC1,2	: CA3102E
IC3	: SN74LS32N
IC4	: SN74LS11N
IC5	: SN74LS112AN
IC6	: SN74LS08N
IC7	: SN74LS00N

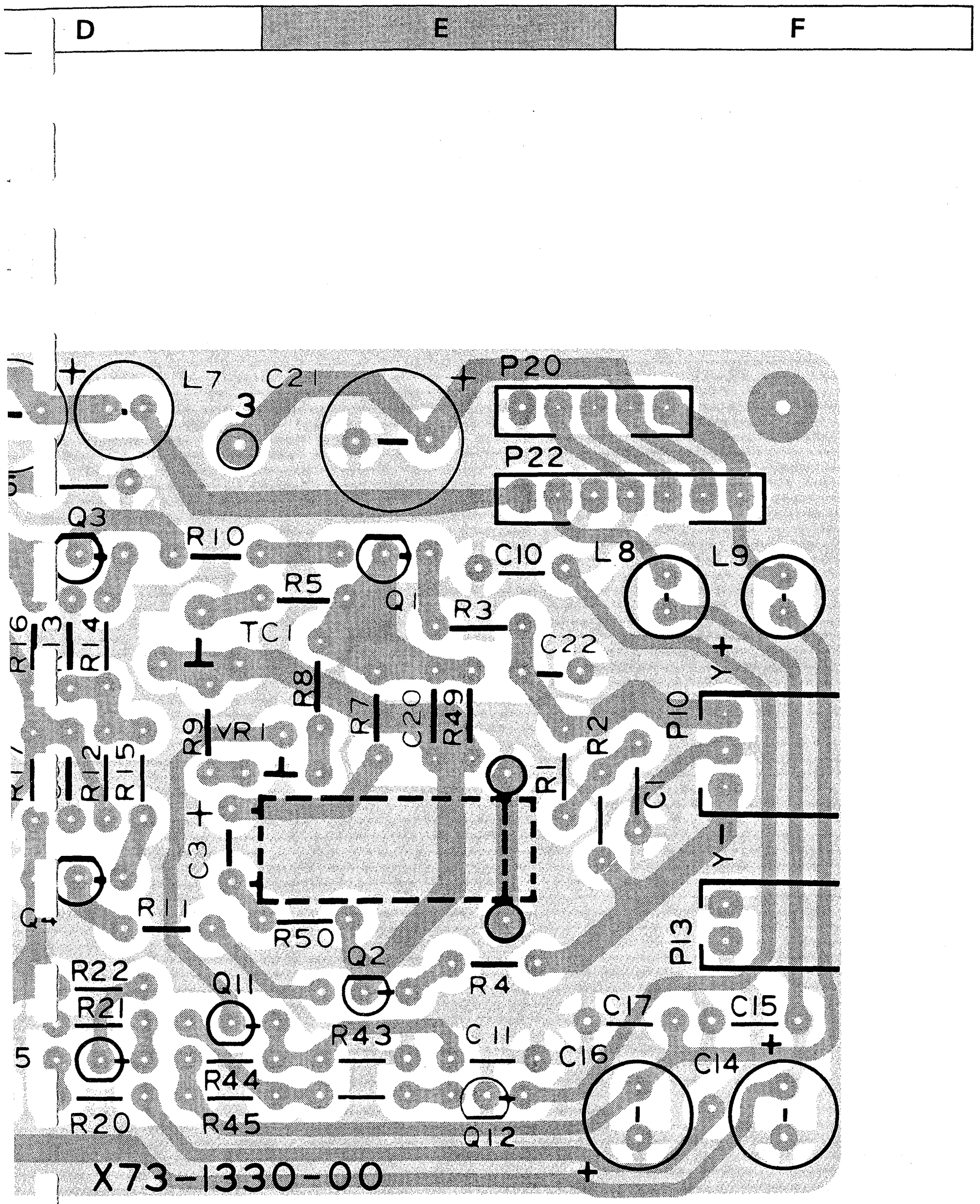
Q1,18~21,23~26,34,46~49,64~71,78,79	: 2SC536KNP(F)
Q2,3,10~13,27,28,31,32 38,39 42 43 50,51,58~61,72,73,76,77	: 2SC1215 (S or T)
Q4~7,14,16,29,40,52~55,62,74	: 2SA838(C)
Q8,9,33,37,56,57	: 2SA608KNP(F)
Q44,45	: 2SA1161
Q15,17,30,41,63,75	: 2SC2671
Q35,36	: 2SC1047(C)
D1~6,13~35,44	: DS442X
D11,12	: WZ-071
D36,37	: WZ-061
D40~43	: 1S2686
TH1	: SDT-1000

PC BOARD

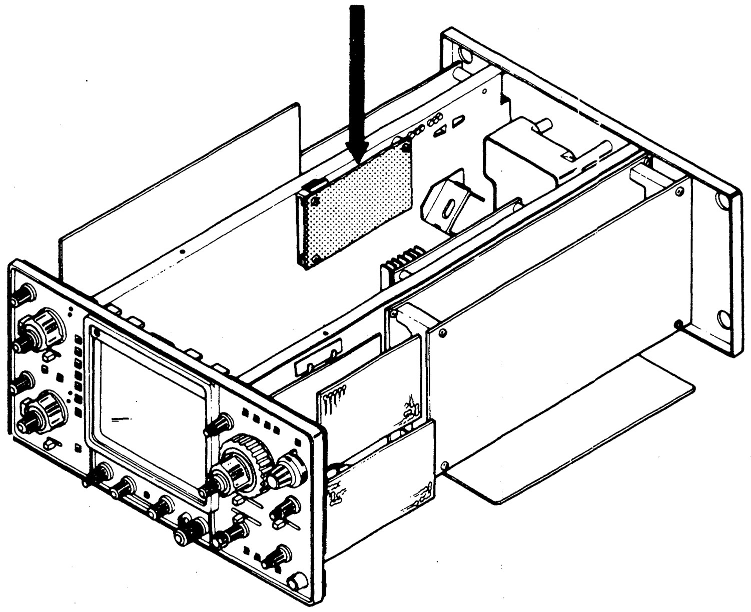
X73-1330-01


A
B
C
D
E
F
1
2
3
4
Y+ 4
R35
R34
Q9
L2
L1
C
E
B
R40
R41
−
R47
2
R46
Q10
L5
L4
R38
R37
C
E
B
Y− 5
C13
Q13
C8
Q7
R30
R32
R27
C12
C5
+
L7
C21
3
+
P20
P22
Q3
R18
TC3
R10
C10
L8
L9
R5
Q1
R3
TC1
C22
R16
R13
R14
R8
R7
C20
R49
Y+
P10
R9
VR1
R2
C7
R25
C18
R54
R17
C6
R12
R15
R1
C1
C3
+
Y−
C9
R29
R28
R26
C19
Q4
R11
R50
P13
Q8
R19
R22
R21
Q11
Q2
R4
Q14
R31
C4
Q5
R43
C11
C17
C15
C16
C14
+
R33
R44
R20
R45
Q12
+
J25-2974-04
X73-1330-00

BOARD

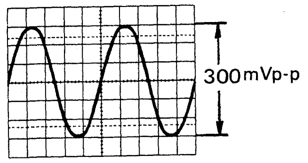

D
E
F
L7
C21
3
P20
P22
Q3
R10
R5
Q1
C10
L8
L9
R3
TC1
C22
R16
13
R14
R8
R7
C20
R49
R2
P10
Y+
R9
VR1
R12
R15
R1
C1
C3
Y-
Q4
R11
R50
P13
Q2
R4
R22
R21
Q11
R43
C11
C17
C15
C16
C14
R44
R20
R45
Q12
X73-1330-00

X73-1330-01
(V. OUTPUT UNIT)

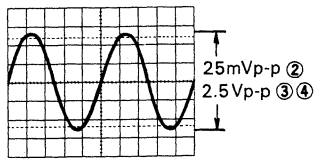


WAVEFORMS

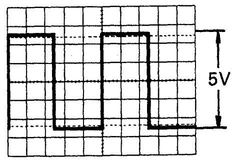
①



②③④

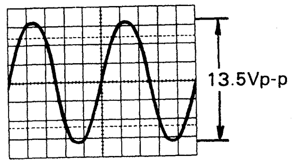


④ (at only ⬍ TRACE SEP position)

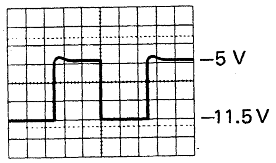


⬍ TRACE. SEP MAX
(AC-GND -DC: GND)

⑤⑥

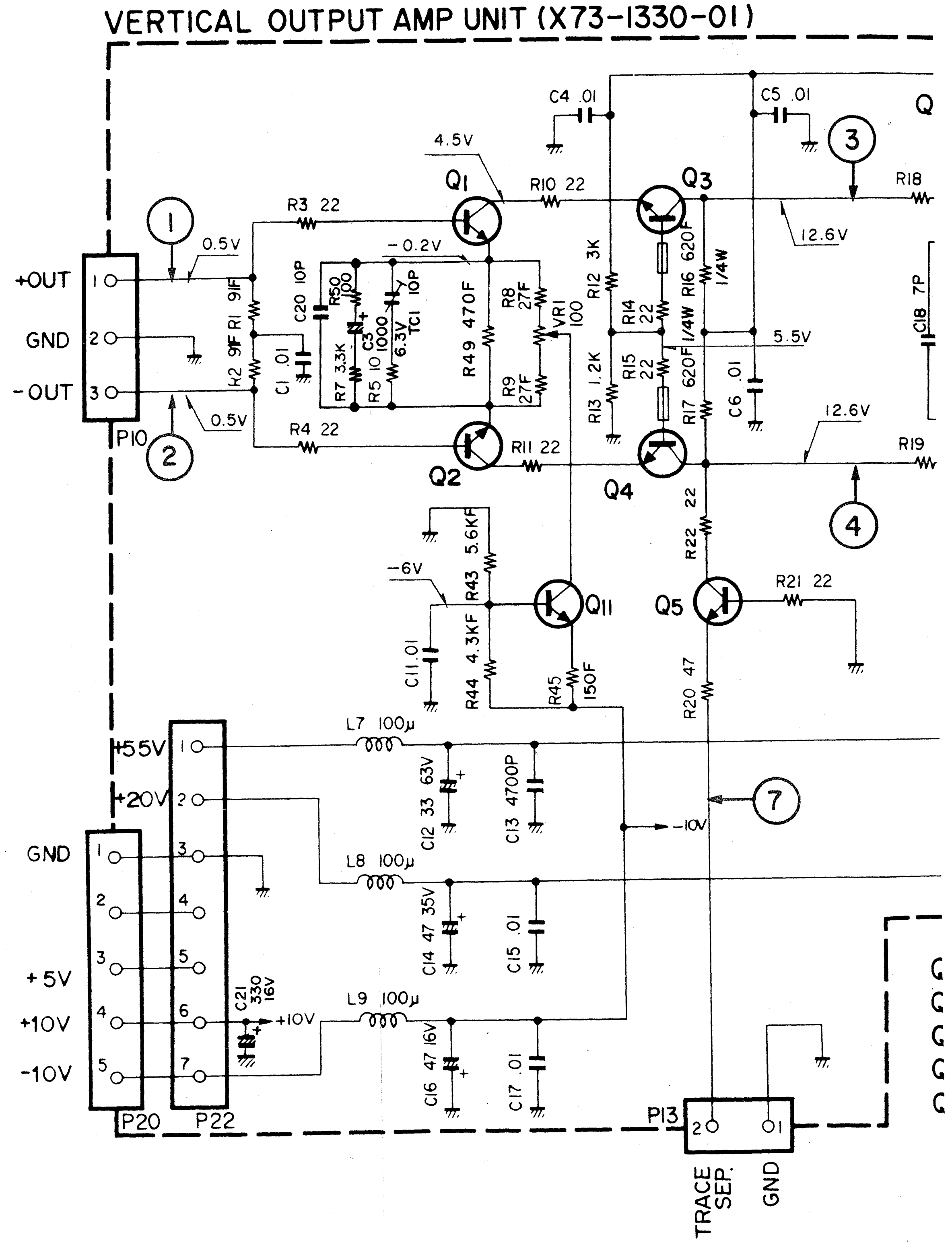


⑦ (at only ⬍ TRACE SEP position)

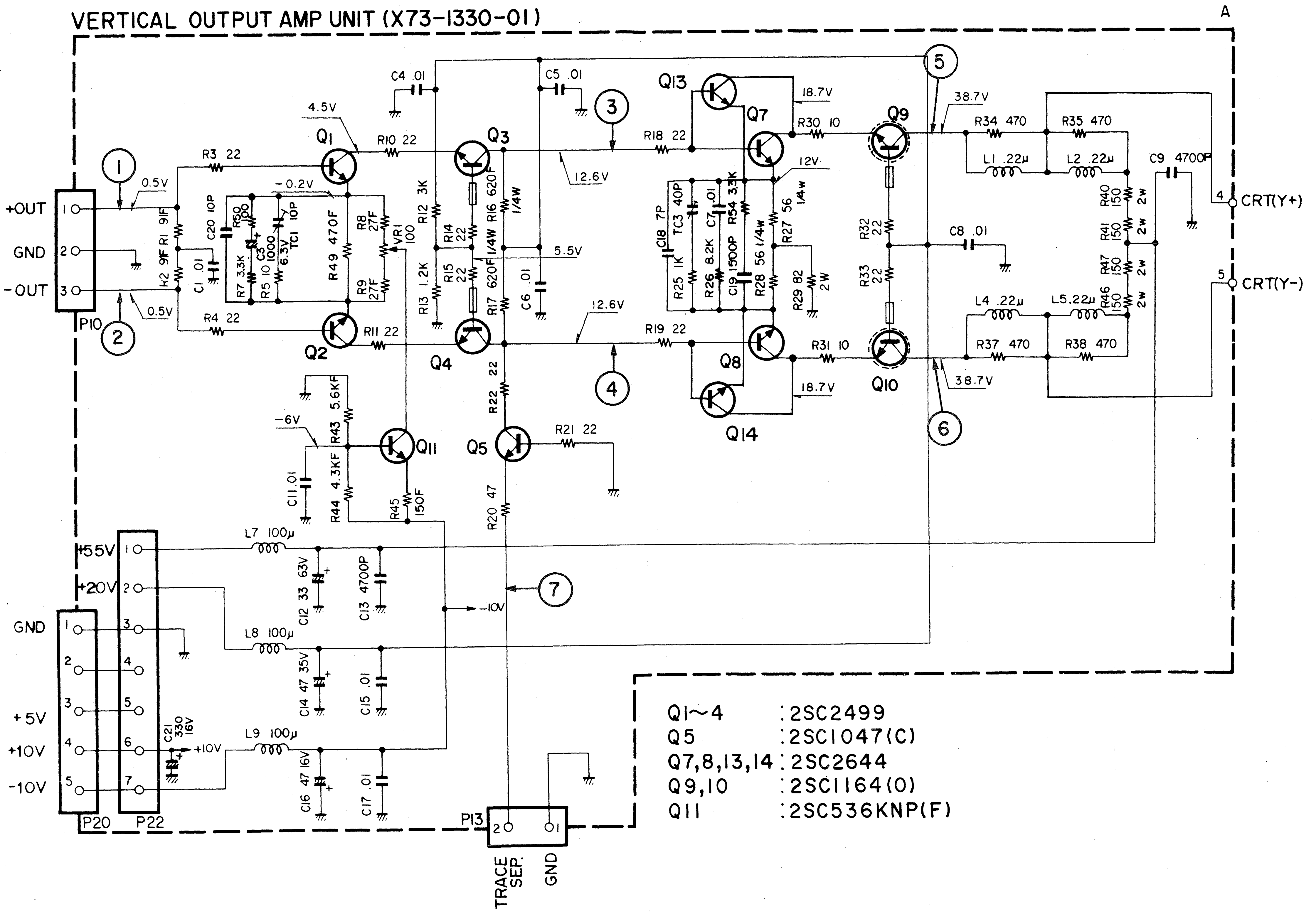


⬍ TRACE. SEP MAX

SCHEMATIC DIA


VERTICAL OUTPUT AMP UNIT (X73-1330-01)
+OUT
GND
-OUT
P10
Q1
Q2
Q3
Q4
Q5
Q11
C4 .01
C5 .01
4.5V
R10 22
R3 22
0.5V
-0.2V
R18
12.6V
5.5V
R19
R4 22
R11 22
R21 22
-6V
L7 100μ
L8 100μ
L9 100μ
+55V
+20V
+5V
+10V
-10V
-10V
P20
P22
P13
TRACE SEP.
GND

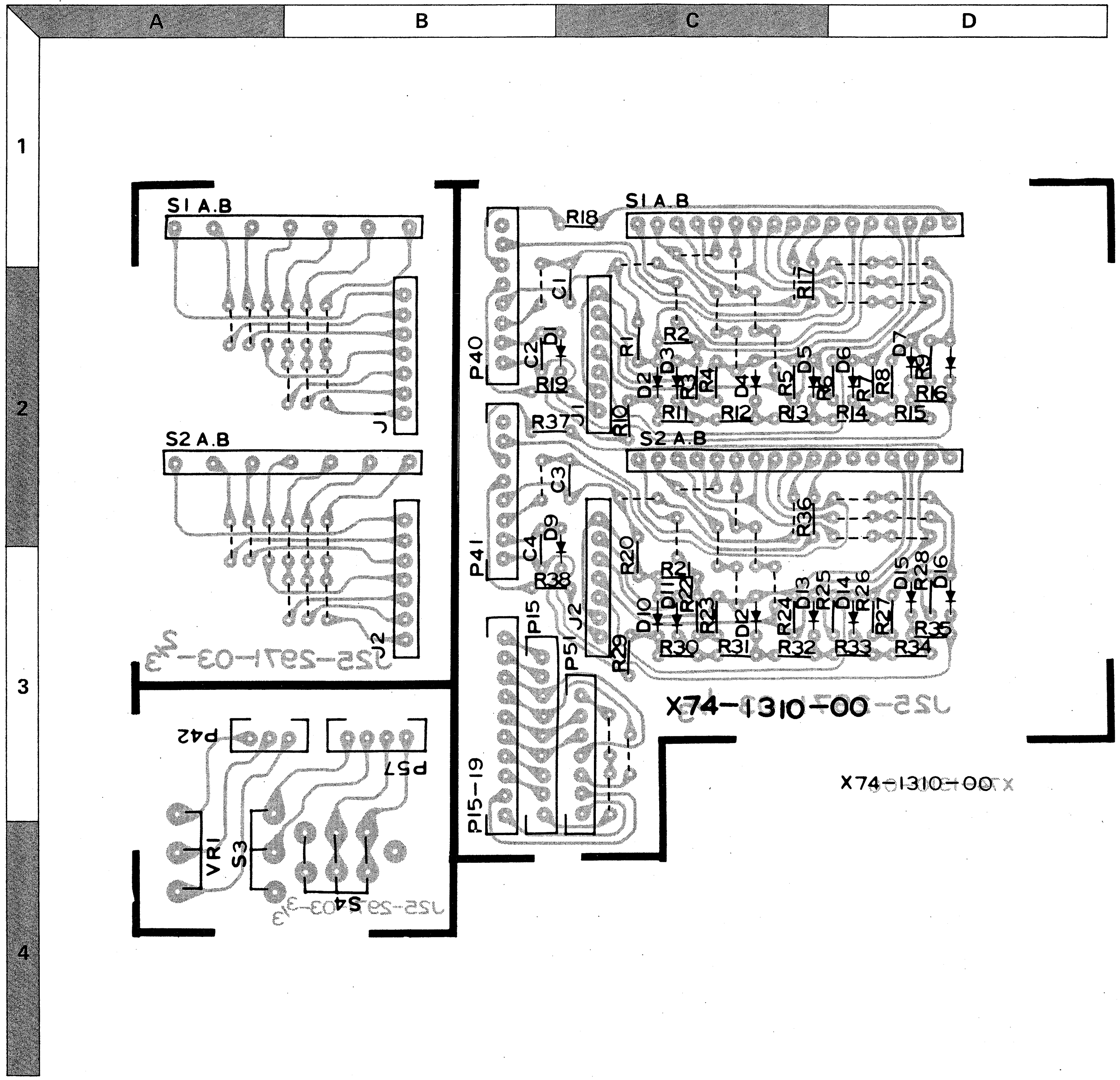
SCHEMATIC DIAGRAM


VERTICAL OUTPUT AMP UNIT (X73-1330-01)
A
+OUT
GND
-OUT
P10
0.5V
0.5V
R3 22
R4 22
R1 91F
R2 91F
C1 .01
C20 10P
R50 100
C3 1000 6.3V
TC1 10P
R7 3.3K
R5 10
-0.2V
R49 470F
R8 27F
R9 27F
VR1 100
Q1
Q2
R10 22
R11 22
4.5V
C4 .01
Q3
Q4
R12 3K
R13 1.2K
R14 22
R15 22
R16 620F 1/4W
R17 620F 1/4W
C5 .01
C6 .01
5.5V
12.6V
12.6V
R22 22
Q5
R21 22
R20 47
Q11
R43 5.6KF
R44 4.3KF
R45 150F
-6V
C11 .01
Q13
Q7
Q8
Q14
R18 22
R19 22
C18 7P
TC3 40P
C7 .01
R54 3.3K
R25 1K
R26 8.2K
C19 1500P
R28 56 1/4W
R27 56 1/4W
R29 82 2W
12V
18.7V
18.7V
R30 10
R31 10
Q9
Q10
R32 22
R33 22
C8 .01
38.7V
38.7V
R34 470
R35 470
R37 470
R38 470
L1 .22μ
L2 .22μ
L4 .22μ
L5 .22μ
R40 150 2W
R41 150 2W
R47 150 2W
R46 150 2W
C9 4700P
4
CRT(Y+)
5
CRT(Y-)
①
②
③
④
⑤
⑥
⑦
+55V
+20V
GND
+5V
+10V
-10V
P20
P22
L7 100μ
L8 100μ
L9 100μ
C12 33 63V
C13 4700P
C14 47 35V
C15 .01
C16 47 16V
C17 .01
C21 330 16V
+10V
-10V
P13
TRACE SEP.
GND

Q1∼4	:2SC2499
Q5	:2SC1047(C)
Q7,8,13,14	:2SC2644
Q9,10	:2SC1164(O)
Q11	:2SC536KNP(F)

PC BOARD

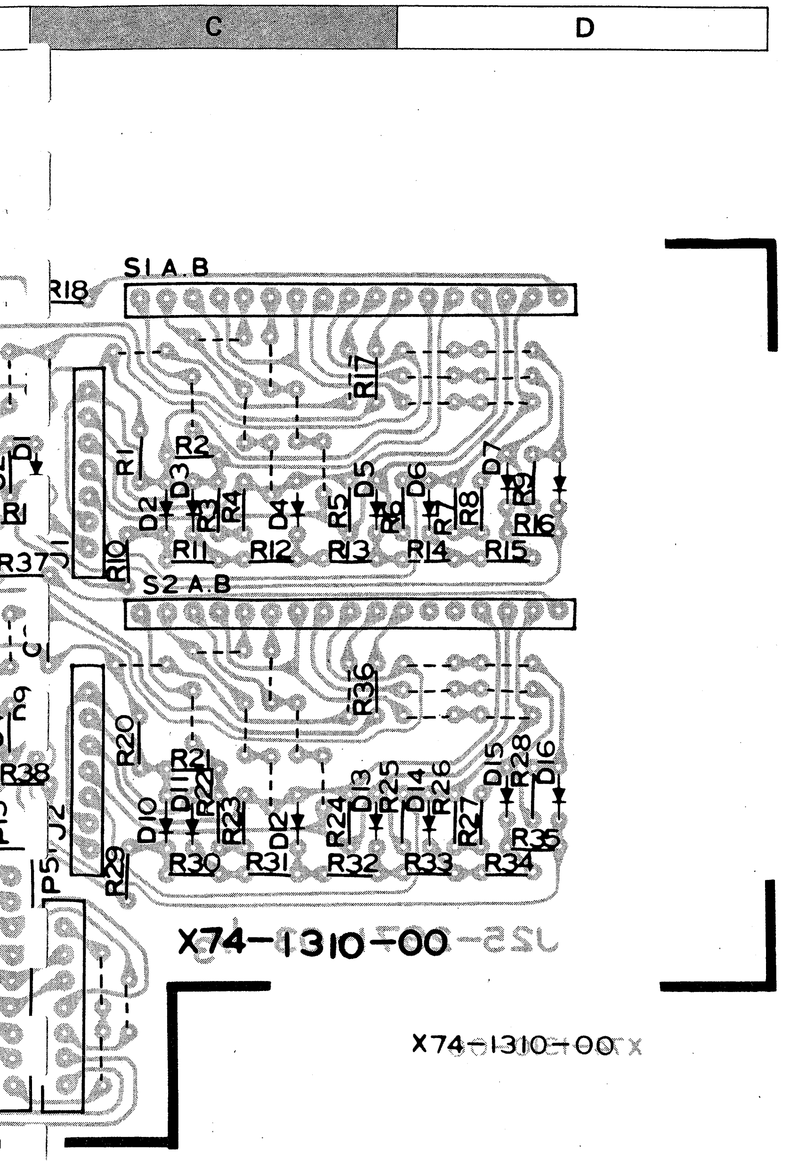
X74-1310-01


A
B
C
D
1
2
3
4
S1 A.B
S2 A.B
J1
J2
P42
P57
VR1
S3
S4
P40
P41
P15
P51
P15-19
C1
C2
C3
C4
D1
D2
D3
D4
D5
D6
D7
D9
D10
D11
D12
D13
D14
D15
D16
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
X74-1310-00
X74-1310-00

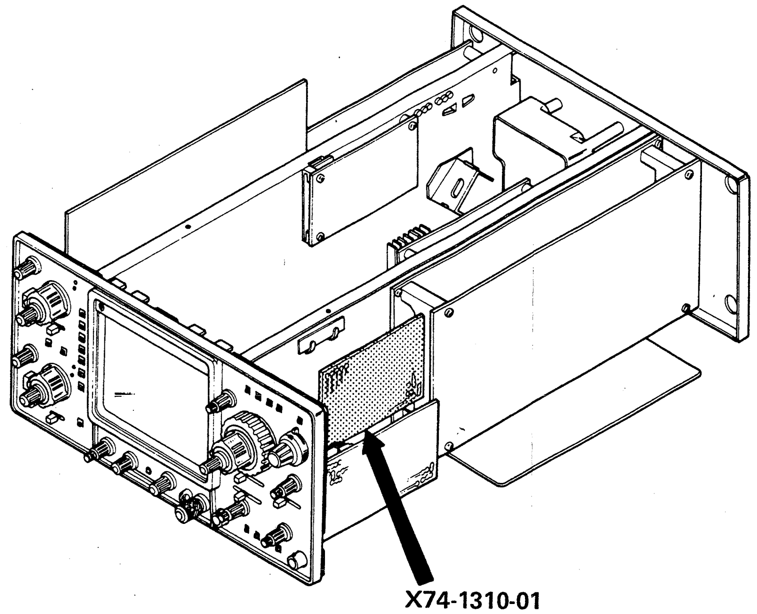
CAUTION

Because the silk symbols in P42 and P57 are reversed, please refer to the Schematic Diagram.

PC BOARD


C
D
S1 A.B
S2 A.B
R1
R2
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
D1
D2
D3
D4
D5
D6
D7
D10
D11
D12
D13
D14
D15
D16
J1
J2
P5
X74-1310-00

X74-1310-00

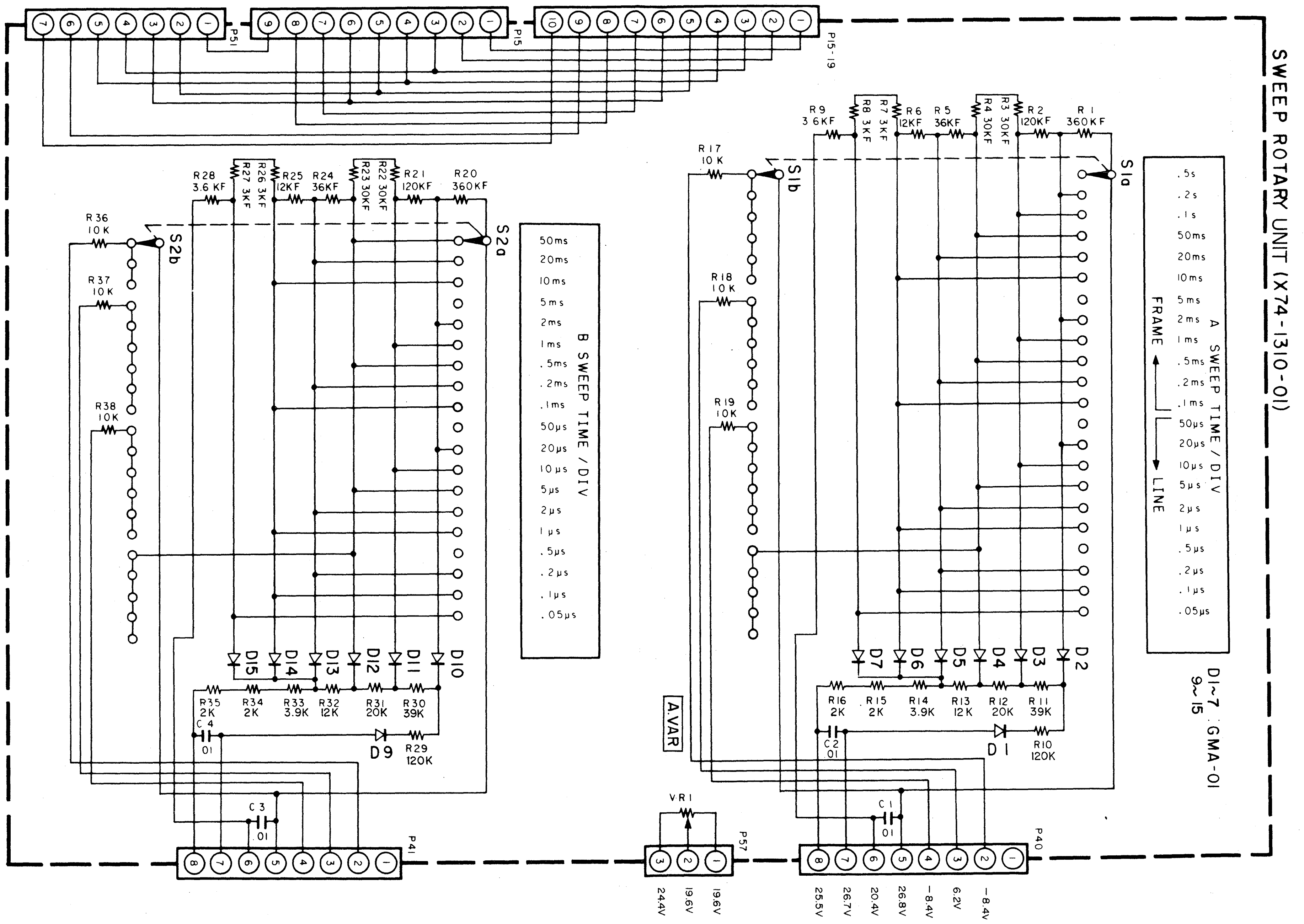


X74-1310-01
(SWEEP ROTARY UNIT)

CAUTION

Because the silk symbols in P42 and P57 are reversed, please refer to the Schematic Diagram.

SCHEMATIC DIAGRAM

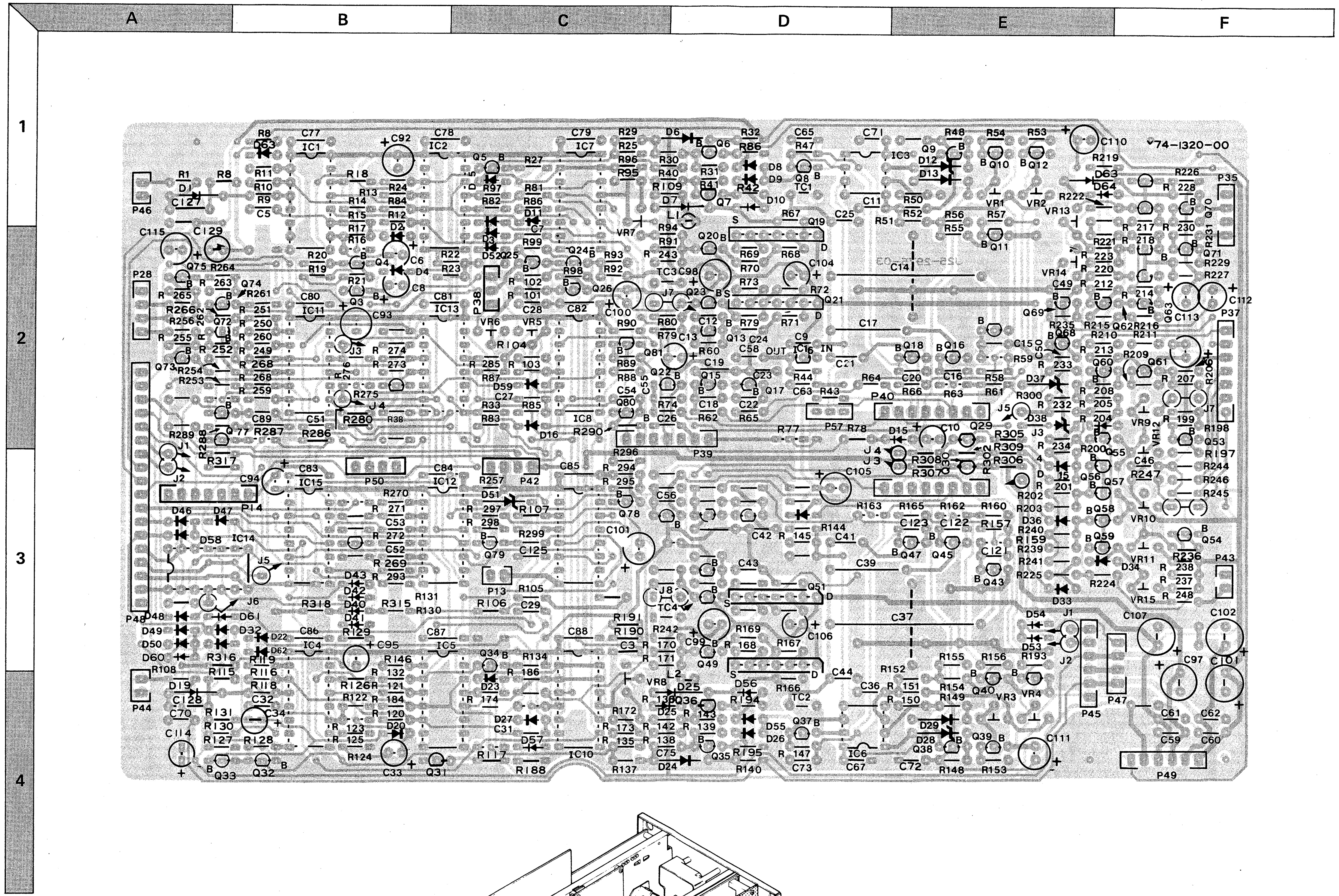


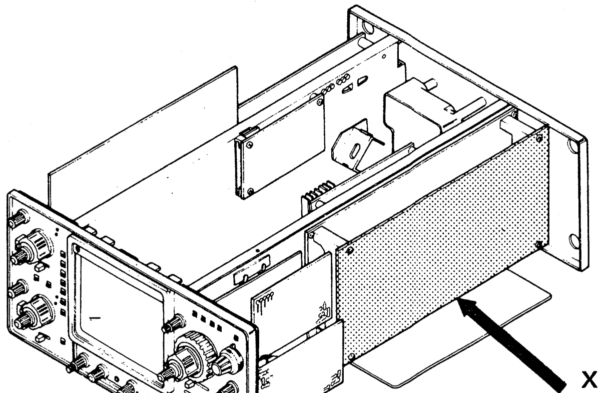
SWEEP ROTARY UNIT (X74-1310-01)
P51
P15
P15-19
P41
P57
P40
S1a
S1b
S2a
S2b
R1 360KF
R2 120KF
R3 30KF
R4 30KF
R5 36KF
R6 12KF
R7 3KF
R8 3KF
R9 3.6KF
R10 120K
R11 39K
R12 20K
R13 12K
R14 3.9K
R15 2K
R16 2K
R17 10K
R18 10K
R19 10K
R20 360KF
R21 120KF
R22 30KF
R23 30KF
R24 36KF
R25 12KF
R26 3KF
R27 3KF
R28 3.6KF
R29 120K
R30 39K
R31 20K
R32 12K
R33 3.9K
R34 2K
R35 2K
R36 10K
R37 10K
R38 10K
C1 .01
C2 .01
C3 .01
C4 .01
D1
D2
D3
D4
D5
D6
D7
D9
D10
D11
D12
D13
D14
D15
VR1
A VAR
B SWEEP TIME / DIV
50ms
20ms
10ms
5ms
2ms
1ms
.5ms
.2ms
.1ms
50μs
20μs
10μs
5μs
2μs
1μs
.5μs
.2μs
.1μs
.05μs
A SWEEP TIME / DIV
.5s
.2s
.1s
50ms
20ms
10ms
5ms
2ms
1ms
.5ms
.2ms
.1ms
50μs
20μs
10μs
5μs
2μs
1μs
.5μs
.2μs
.1μs
.05μs
FRAME
LINE
D1~7 9~15 : GMA-01
24.4V
19.6V
19.6V
25.5V
26.7V
20.4V
26.8V
-8.4V
6.2V
-8.4V

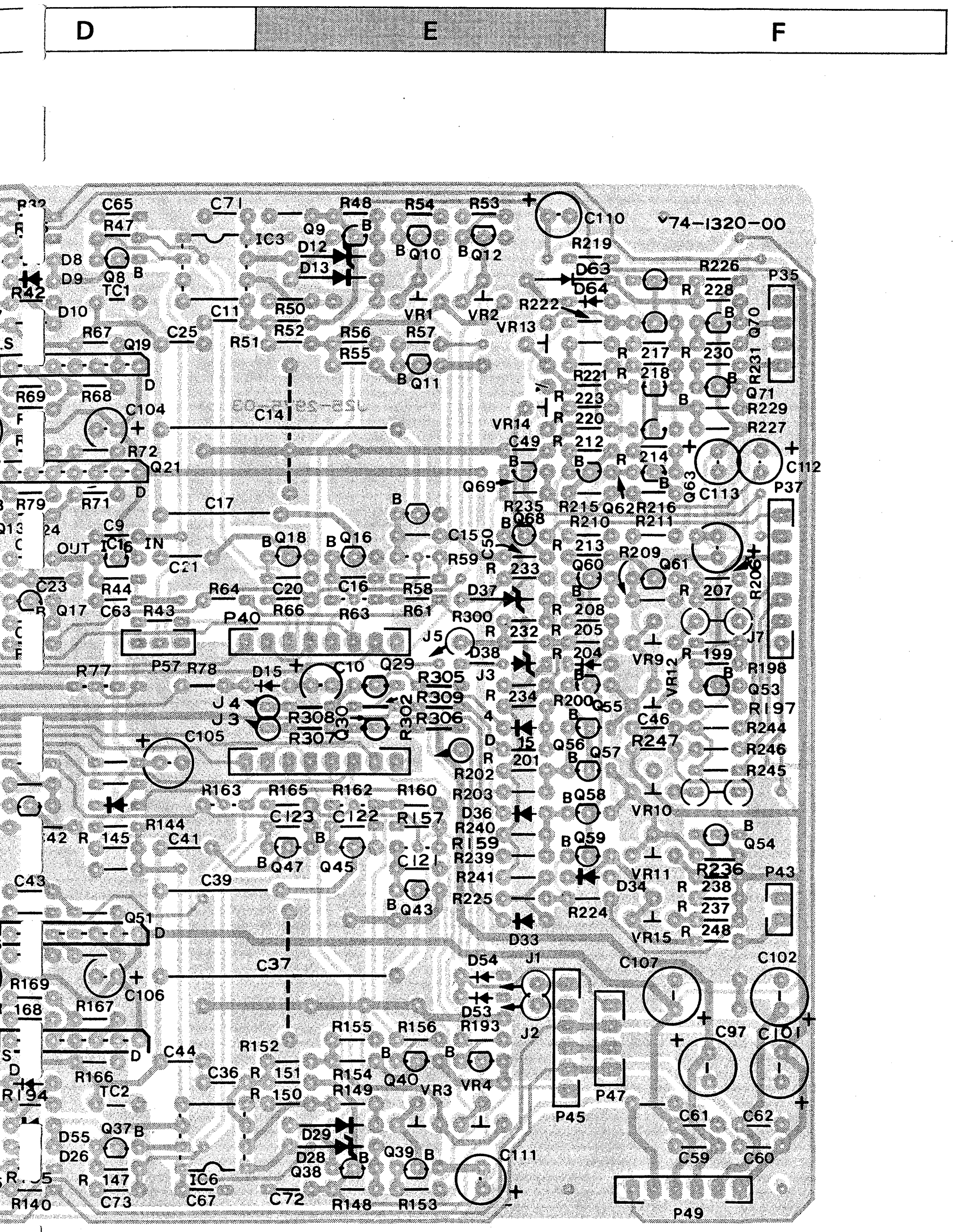
PC BOARD

X74-1320-01

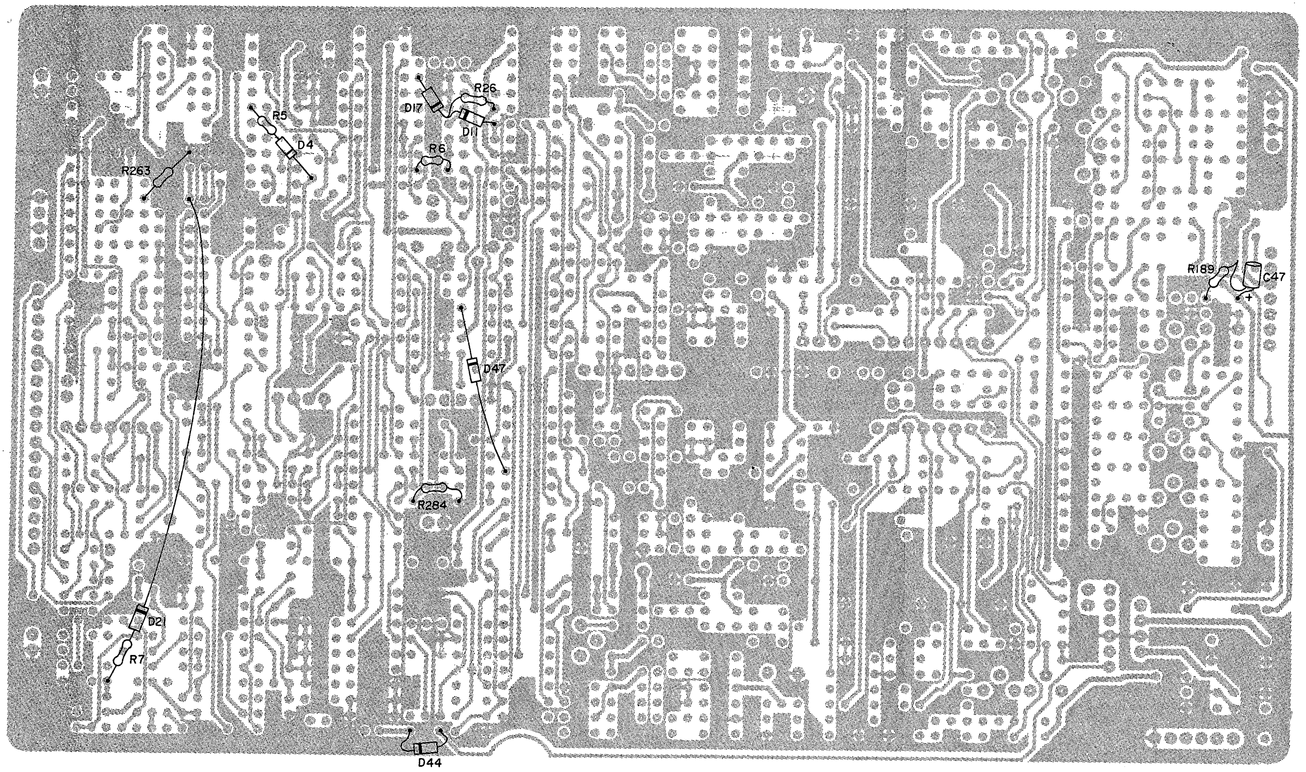
X74-


A
B
C
D
E
F
1
2
3
4
X74-1320-00
P46
P28
P48
P44
P35
P37
P39
P40
P42
P43
P45
P47
P49
P50
P57

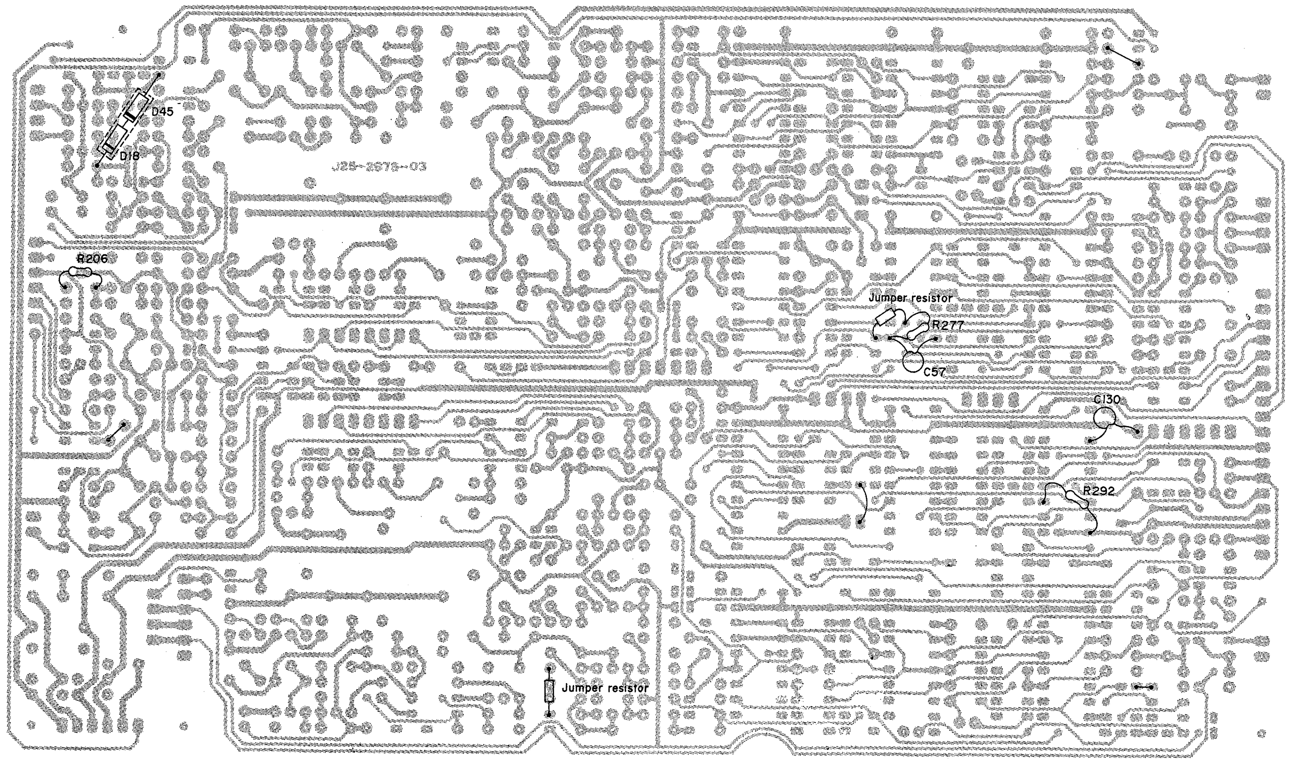

X74-1320-01
(TRIG SWEEP UNIT)


D
E
F
X74-1320-00
J25-2975-03
C65
R47
C71
R48
R54
R53
C110
D8
D9
Q8
TC1
D10
IC3
Q9
D12
D13
Q10
Q12
R219
D63
D64
R226
R228
P35
R42
C11
R50
R52
R51
VR1
VR2
R222
VR13
R67
Q19
C25
R56
R57
R55
Q11
R221
R217
R230
R218
R231
Q70
Q71
R223
R229
R220
R227
R69
R68
C104
C14
VR14
C49
R212
R214
C112
R72
Q21
Q69
Q63
C113
P37
R79
R71
C9
C17
R235
Q68
R215
Q62
R216
R210
R211
OUT
IC1
IN
Q18
Q16
C150
C50
R213
R209
Q60
Q61
C21
R59
R233
C23
R44
R64
C20
C16
R58
D37
R207
R206
Q17
C63
R43
R66
R63
R61
R300
R208
P40
R232
R205
J7
P57
R78
J5
D38
R204
VR9
R199
R198
R77
D15
C10
Q29
R305
J3
VR12
Q53
J4
R309
R234
R200
Q55
R197
R308
R302
R306
C46
R244
C105
R307
D
R247
Q56
Q57
R246
R202
R201
R245
R163
R165
R162
R160
R203
Q58
VR10
D36
R240
R145
R144
C123
C122
R157
R159
Q59
Q54
C41
Q47
Q45
C121
R239
R241
VR11
R236
P43
C43
C39
D34
R238
Q43
R225
R224
R237
Q51
D33
VR15
R248
C37
D54
J1
C107
C102
R169
C106
D53
R167
R168
R155
R156
R193
J2
C97
C101
C44
R152
Q40
VR3
VR4
R166
C36
R151
R154
R150
R149
P45
P47
TC2
R194
Q37
D29
C61
C62
D55
D26
R147
D28
Q38
Q39
C111
C59
C60
R140
C73
IC6
C67
C72
R148
R153
P49

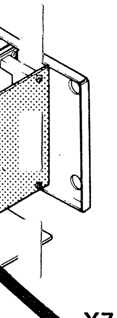
X74-1320-01


R263
R5
D4
D17
R26
D11
R6
R189
C47
D47
R284
D21
R7
D44

(Parts Side View)


D45
D18
J25-2975-03
R206
Jumper resistor
R277
C57
C130
R292
Jumper resistor

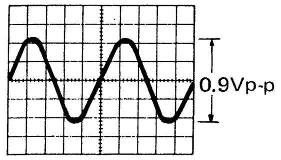
(Foil Side View)



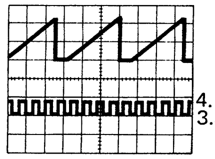
X74-1320-01
(TRIG SWEEP UNIT)

WAVEFORMS

①

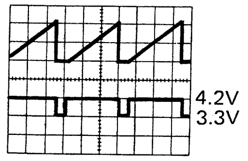


②

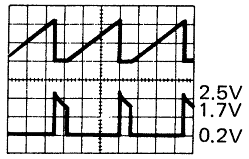


Input signal 1kHz

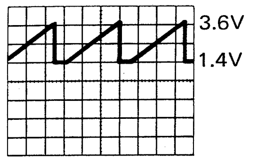
③



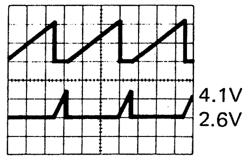
④



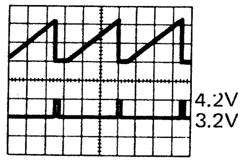
⑤



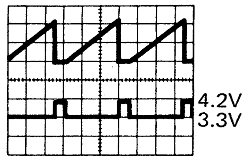
⑥



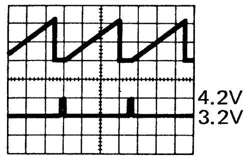
⑦



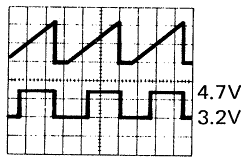
⑧



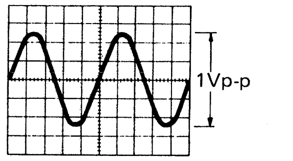
⑨



⑩

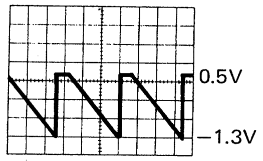


⑪-1

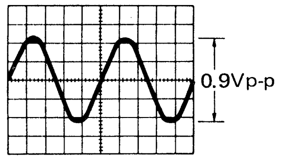


(H. DISPLAY: X-Y)

⑪-2

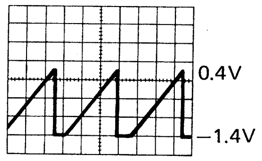


⑫-1

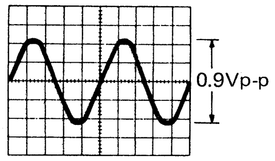


(H. DISPLAY: X-Y)

⑫-2

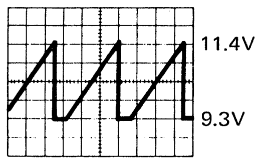


⑬-1

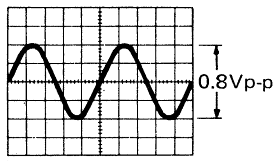


(H. DISPLAY: X-Y)

⑬-2

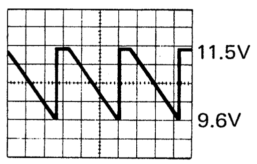


⑭-1

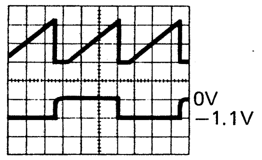


(H. DISPLAY: X-Y)

⑭-2

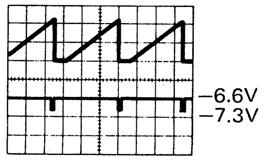


⑮



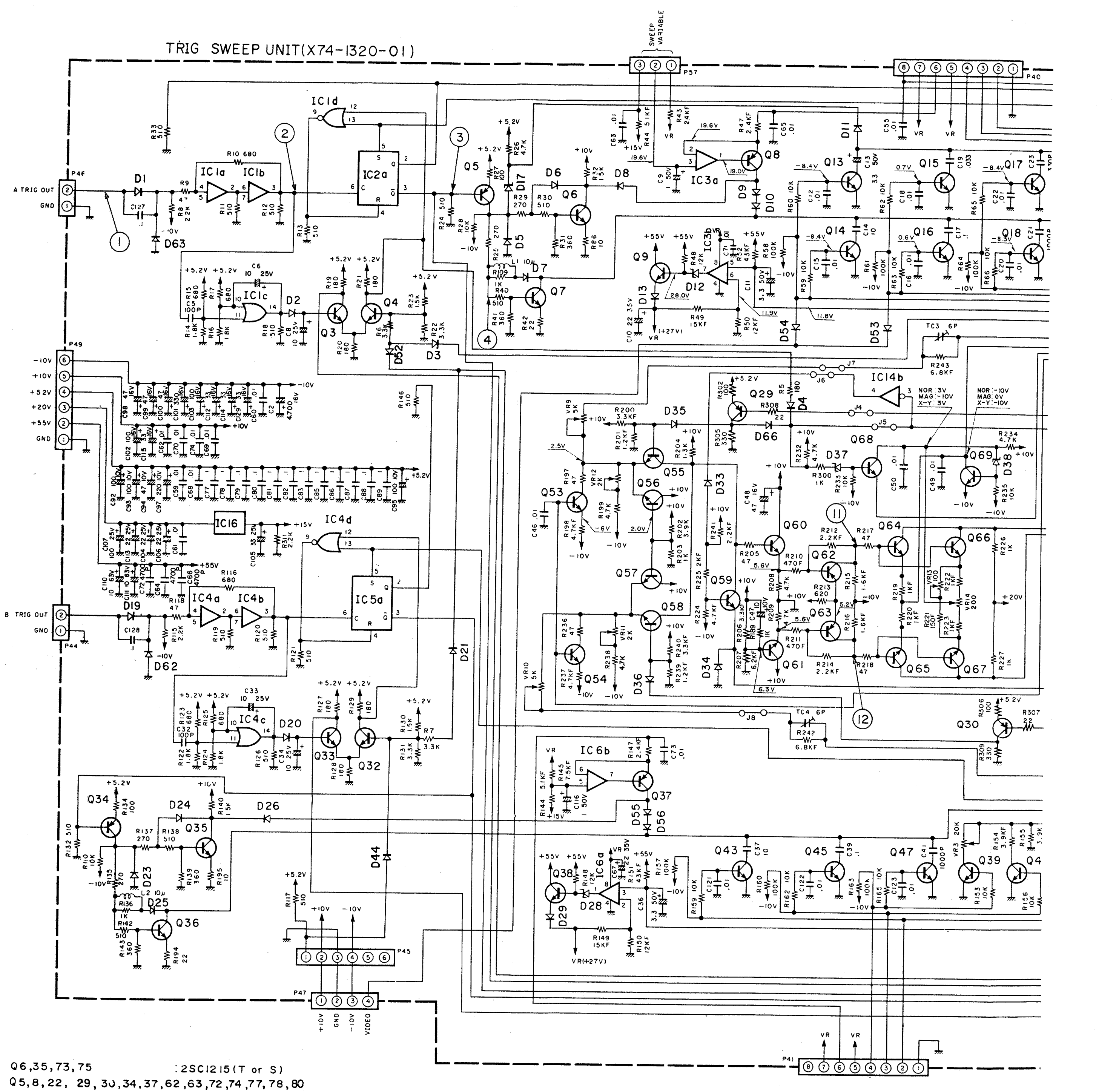
H. DISPLAY: ALT
♦TRACE SEP: Fully CCW

⑯



H. DISPLAY: ALT

SCHEMATIC DIA

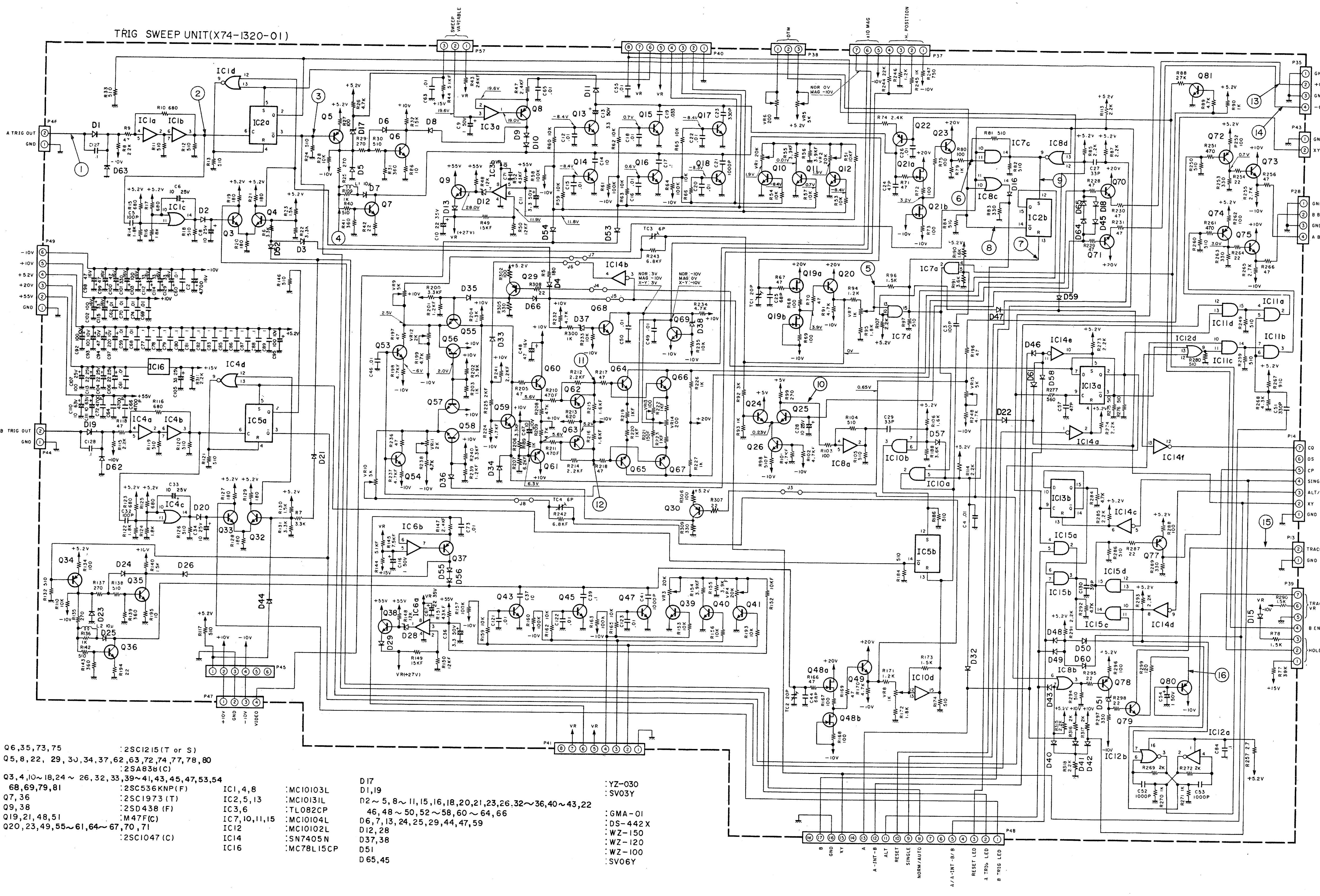

TRIG SWEEP UNIT(X74-1320-01)
SWEEP VARIABLE
P57
P40
P41
P43
P44
P45
P47
P49
A TRIG OUT
B TRIG OUT
GND
IC1a
IC1b
IC1c
IC1d
IC2a
IC3a
IC3b
IC4a
IC4b
IC4c
IC4d
IC5a
IC6a
IC6b
IC14b
IC16
TC3 6P
TC4 6P
NOR 3V
MAG −10V
X-Y 3V
+10V
GND
−10V
VIDEO
VR
VR(+27V)
+5.2V
+10V
−10V
+15V
+20V
+55V

Q6,35,73,75 :2SC1215(T or S)
Q5,8,22, 29, 30,34,37,62,63,72,74,77,78,80 :2SA838(C)
Q3,4,10~18,24~ 26,32,33,39~41,43,45,47,53,54 68,69,79,81 :2SC536KNP(F)
Q7,36 :2SC1973(T)
Q9,38 :2SD438 (F)
Q19,21,48,51 :M47F(C)
Q20,23,49,55~61,64~67,70,71 :2SC1047(C)

IC1,4,8 :MC10103L
IC2,5,13 :MC10131L
IC3,6 :TL082CP
IC7,10,11,15 :MC10104L
IC12 :MC10102L
IC14 :SN7405N
IC16 :MC78L15CP

D17 :YZ-030
D1,19 :SV03Y
D2~5,8~11,15,16,18,20,21,23,26,32~36,40~43,22
46,48~50,52~58,60~64,66 :GMA-01
D6,7,13,24,25,29,44,47,59 :DS-442X
D12,28 :WZ-150
D37,38 :WZ-120
D51 :WZ-100
D65,45 :SV06Y

SCHEMATIC DIAGRAM


TRIG SWEEP UNIT(X74-1320-01)
SWEEP VARIABLE
P57
P40
DTM
P38
×10 MAG
H. POSITION
P37
P35
GND
+OUT
GND
-OUT
P43
GND
XY OUT
P28
GND
B BLANKING
GND
A BLANKING
P4F
A TRIG OUT
GND
P49
-10V
+10V
+5.2V
+20V
+55V
GND
B TRIG OUT
GND
P44
P14
CQ
DS
CP
SINGLE/PLU
ALT/CHOP
XY
GND
P13
TRACE SEP
GND
P39
TRACE SEP VR
B END A
HOLD OFF
P45
P47
+10V
GND
-10V
VIDEO
P41
VR
P48
B
GND
XY
A
A-INT-B
ALT
RESET
SINGLE
NORM/AUTO
A/A-INT-B/B
RESET LED
A TRIG LED
B TRIG LED

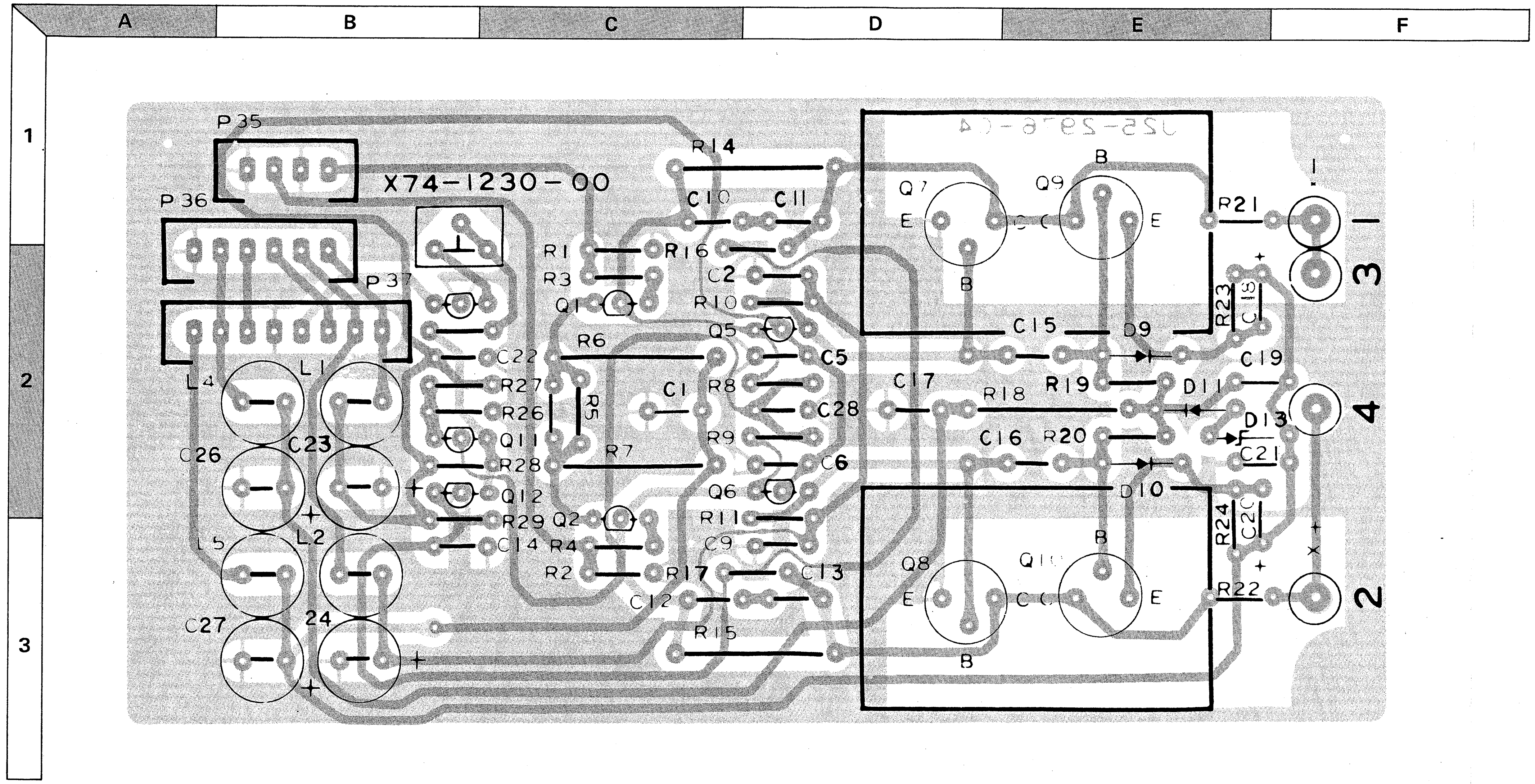
Q6,35,73,75 :2SC1215(T or S)
Q5,8,22, 29,30,34,37,62,63,72,74,77,78,80
:2SA838(C)
Q3,4,10~18,24~ 26,32,33,39~41,43,45,47,53,54
68,69,79,81 :2SC536KNP(F)
Q7,36 :2SC1973(T)
Q9,38 :2SD438(F)
Q19,21,48,51 :M47F(C)
Q20,23,49,55~61,64~67,70,71
:2SC1047(C)

IC1,4,8 :MC10103L
IC2,5,13 :MC10131L
IC3,6 :TL082CP
IC7,10,11,15 :MC10104L
IC12 :MC10102L
IC14 :SN7405N
IC16 :MC78L15CP

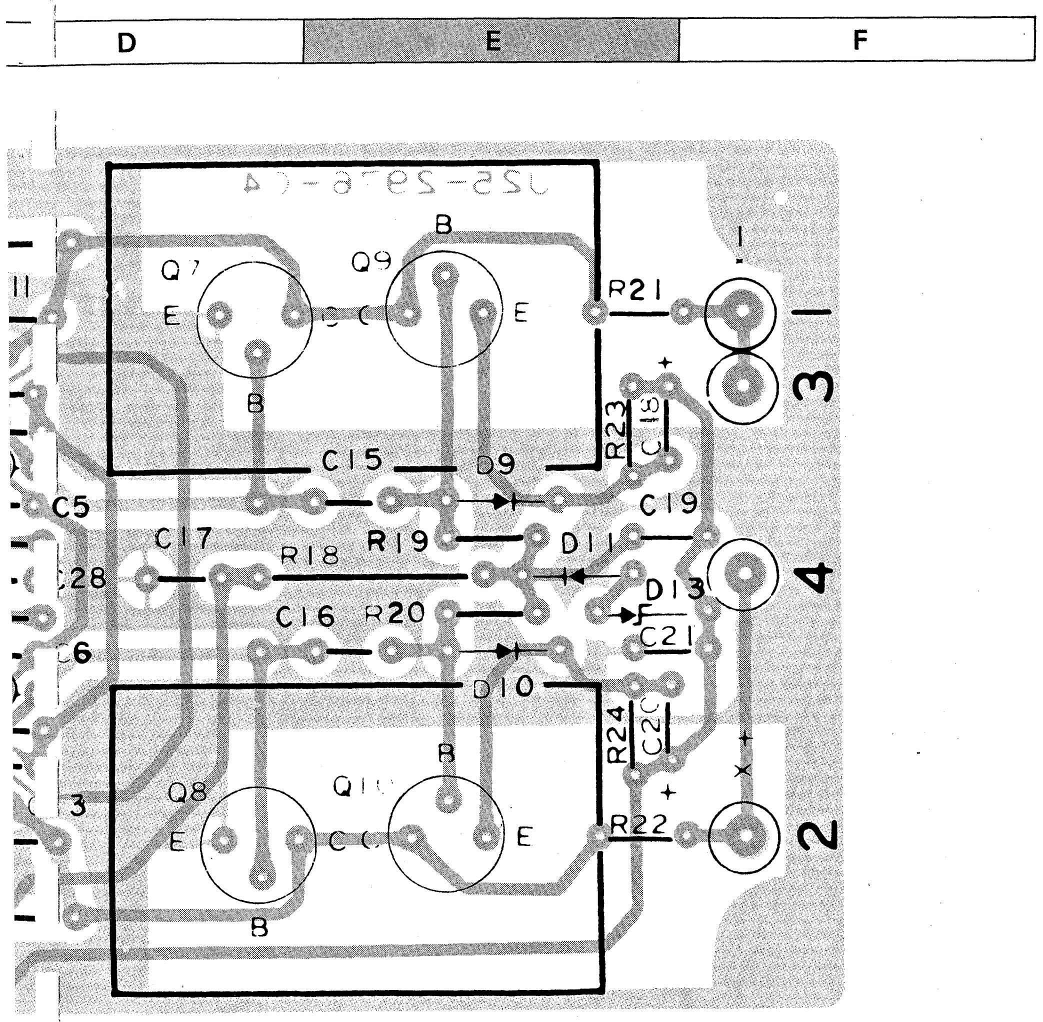
D17 :YZ-030
D1,19 :SV03Y
D2~5,8~11,15,16,18,20,21,23,26.32~36,40~43,22
46,48~50,52~58,60~64,66 :GMA-01
D6,7,13,24,25,29,44,47,59 :DS-442X
D12,28 :WZ-150
D37,38 :WZ-120
D51 :WZ-100
D65,45 :SV06Y

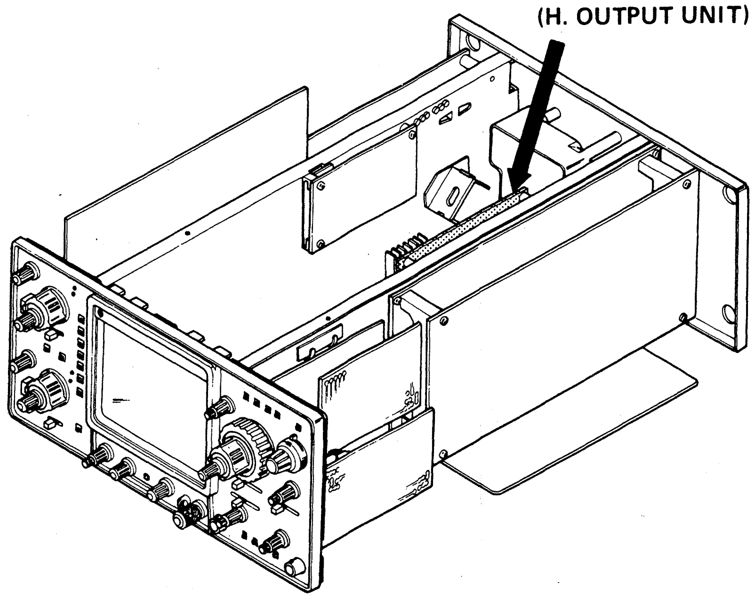
PC BOARD

X74-1230-01


A
B
C
D
E
F
1
2
3
P35
P36
P37
X74-1230-00
R14
C10
C11
Q7
Q9
B
E
C
R21
R1
R16
R3
C2
Q1
R10
Q5
R6
C22
C5
C15
D9
R23
C18
C19
R27
R26
R5
C1
R8
C28
C17
R18
R19
D11
D13
Q11
R7
R9
C6
C16
R20
C21
R28
Q12
Q6
D10
R29
Q2
R11
C9
R24
C20
R4
C14
R2
R17
C13
Q8
Q10
R22
C12
R15
L1
L4
C26
C23
L2
L5
C27
24
1
3
4
2

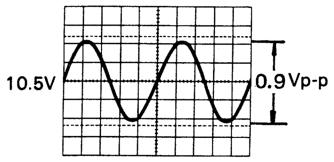
BOARD


D
E
F
Q7
Q9
B
E
C
R21
1
3
R23
C18
C15
D9
C19
C5
C17
R18
R19
D11
4
C28
D13
C16
R20
C21
C6
D10
R24
C20
Q8
Q10
R22
2
3


X74-1230-01
(H. OUTPUT UNIT)

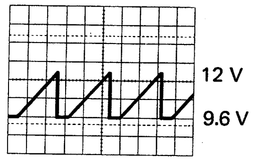
WAVEFORMS

①-1

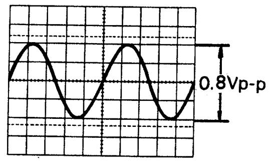


H.DISPLAY: X-Y

①-2

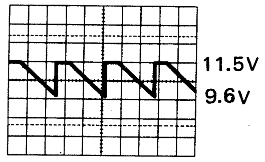


②-1

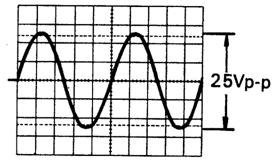


H.DISPLAY :X-Y

②-2

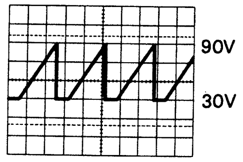


③-1 ④-1

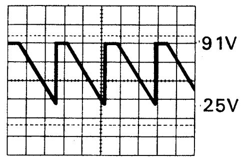


H.DISPLAY: X-Y

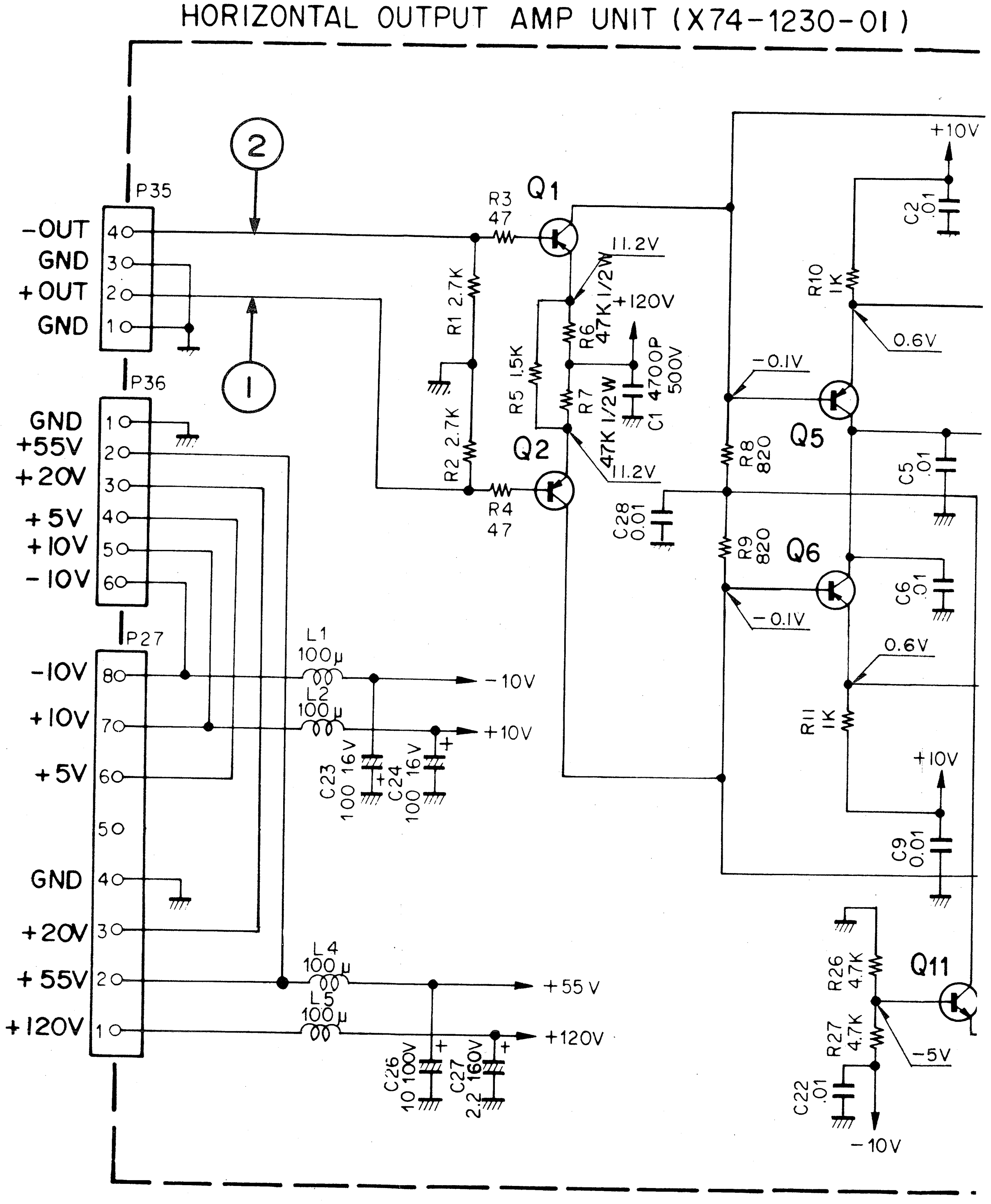
③-2



④-2

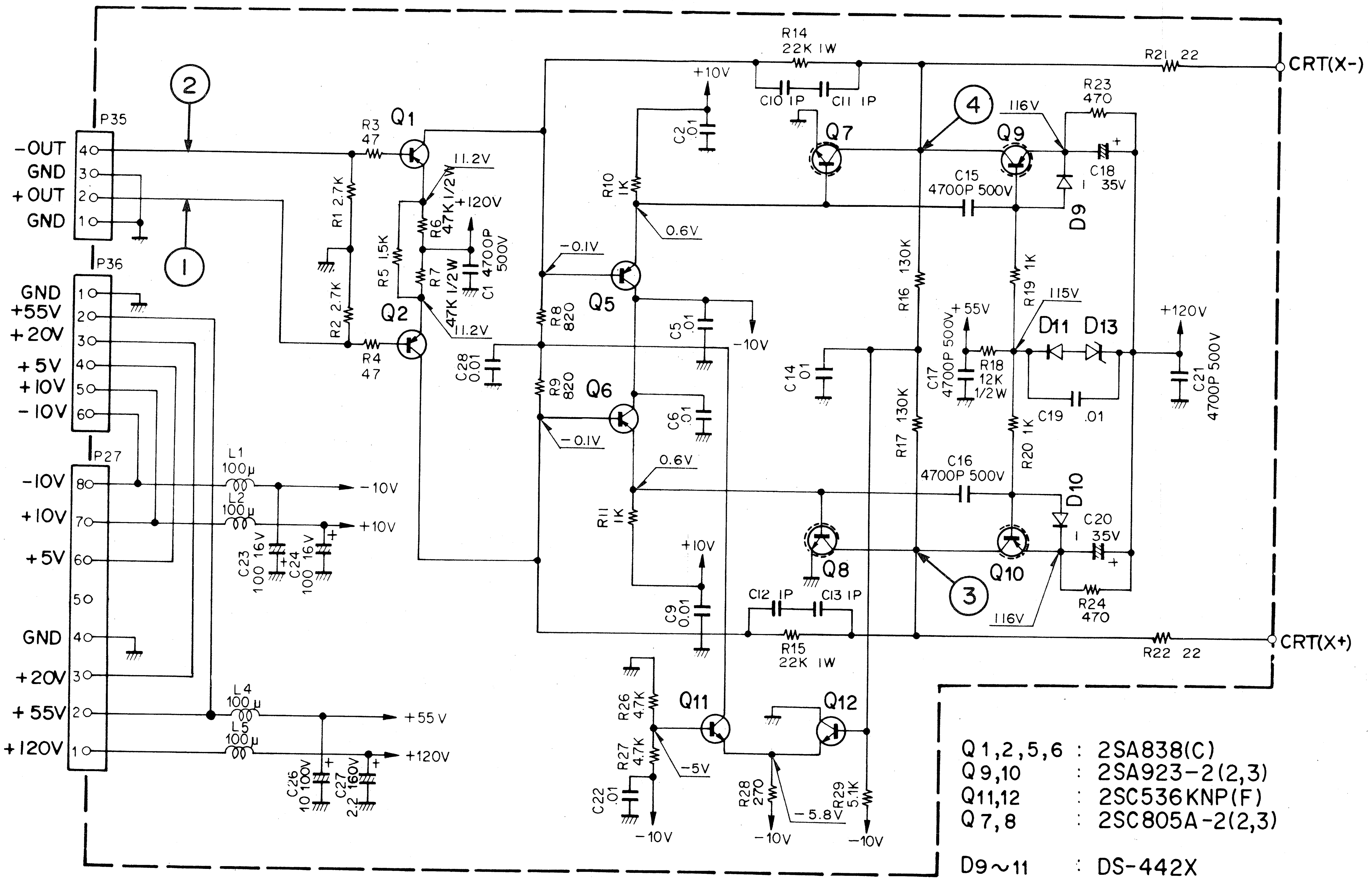


SCHEMATIC DI


HORIZONTAL OUTPUT AMP UNIT (X74-1230-01)
②
①
P35
-OUT 4
GND 3
+OUT 2
GND 1
P36
GND 1
+55V 2
+20V 3
+5V 4
+10V 5
-10V 6
P27
-10V 8
+10V 7
+5V 6
5
GND 4
+20V 3
+55V 2
+120V 1
R3 47
Q1
R1 2.7K
R2 2.7K
R4 47
Q2
R5 1.5K
R6 47K 1/2W
R7 47K 1/2W
C1 4700P 500V
11.2V
+120V
11.2V
C28 0.01
L1 100µ
L2 100µ
-10V
+10V
C23 100 16V
C24 100 16V
L4 100µ
L5 100µ
+55V
+120V
C26 10 100V
C27 2.2 160V
+10V
C2 .01
R10 1K
0.6V
-0.1V
Q5
R8 820
C5 .01
R9 820
Q6
C6 .01
-0.1V
0.6V
R11 1K
+10V
C9 0.01
R26 4.7K
Q11
R27 4.7K
-5V
C22 .01
-10V

SCHEMATIC DIAGRAM

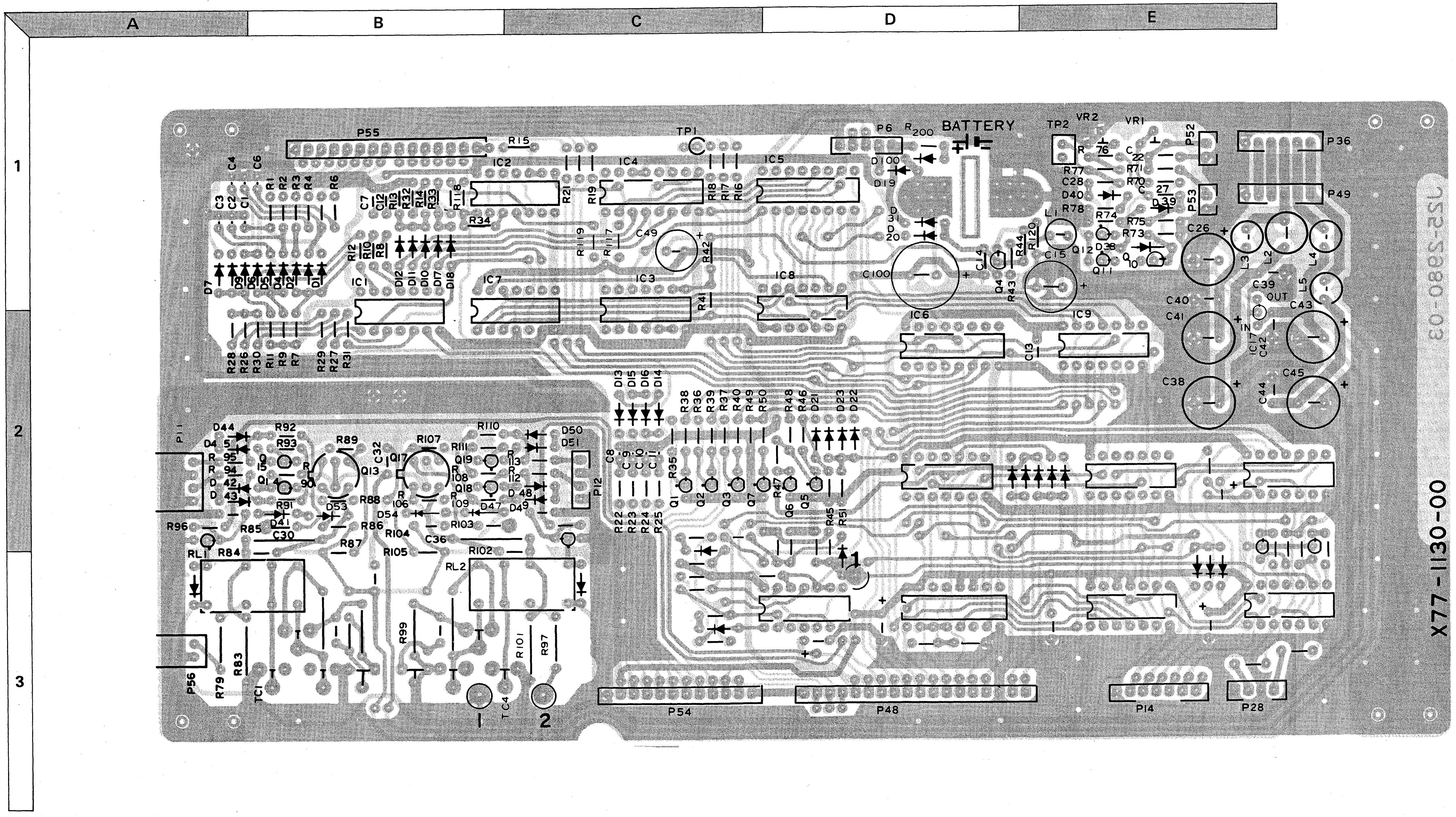
HORIZONTAL OUTPUT AMP UNIT (X74-1230-01)


P35
-OUT 4
GND 3
+OUT 2
GND 1
P36
GND 1
+55V 2
+20V 3
+5V 4
+10V 5
-10V 6
P27
-10V 8
+10V 7
+5V 6
5
GND 4
+20V 3
+55V 2
+120V 1
①
②
③
④
R3 47
Q1
R1 2.7K
R2 2.7K
R4 47
Q2
R5 1.5K
R6 47K 1/2W
R7 47K 1/2W
11.2V
+120V
C1 4700P 500V
R8 820
R9 820
-0.1V
Q5
Q6
C28 0.01
R10 1K
R11 1K
0.6V
C2 .01
C5 .01
C6 .01
C9 0.01
+10V
-10V
R14 22K 1W
C10 1P
C11 1P
C12 1P
C13 1P
R15 22K 1W
Q7
Q8
Q9
Q10
116V
115V
C15 4700P 500V
C16 4700P 500V
C17 4700P 500V
C14 .01
R16 130K
R17 130K
R18 12K 1/2W
R19 1K
R20 1K
+55V
D9
D10
D11
D13
C19 .01
C18 1 35V
C20 1 35V
R23 470
R24 470
R21 22
R22 22
+120V
C21 4700P 500V
CRT(X-)
CRT(X+)
L1 100μ
L2 100μ
C23 100 16V
C24 100 16V
L4 100μ
L5 100μ
C26 10 100V
C27 2.2 160V
+55V
R26 4.7K
R27 4.7K
C22 .01
Q11
Q12
-5V
R28 270
-5.8V
R29 5.1K

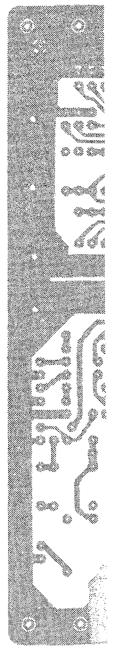
Q1,2,5,6 : 2SA838(C)
Q9,10 : 2SA923-2(2,3)
Q11,12 : 2SC536KNP(F)
Q7,8 : 2SC805A-2(2,3)
D9~11 : DS-442X
D13 : WZ-050

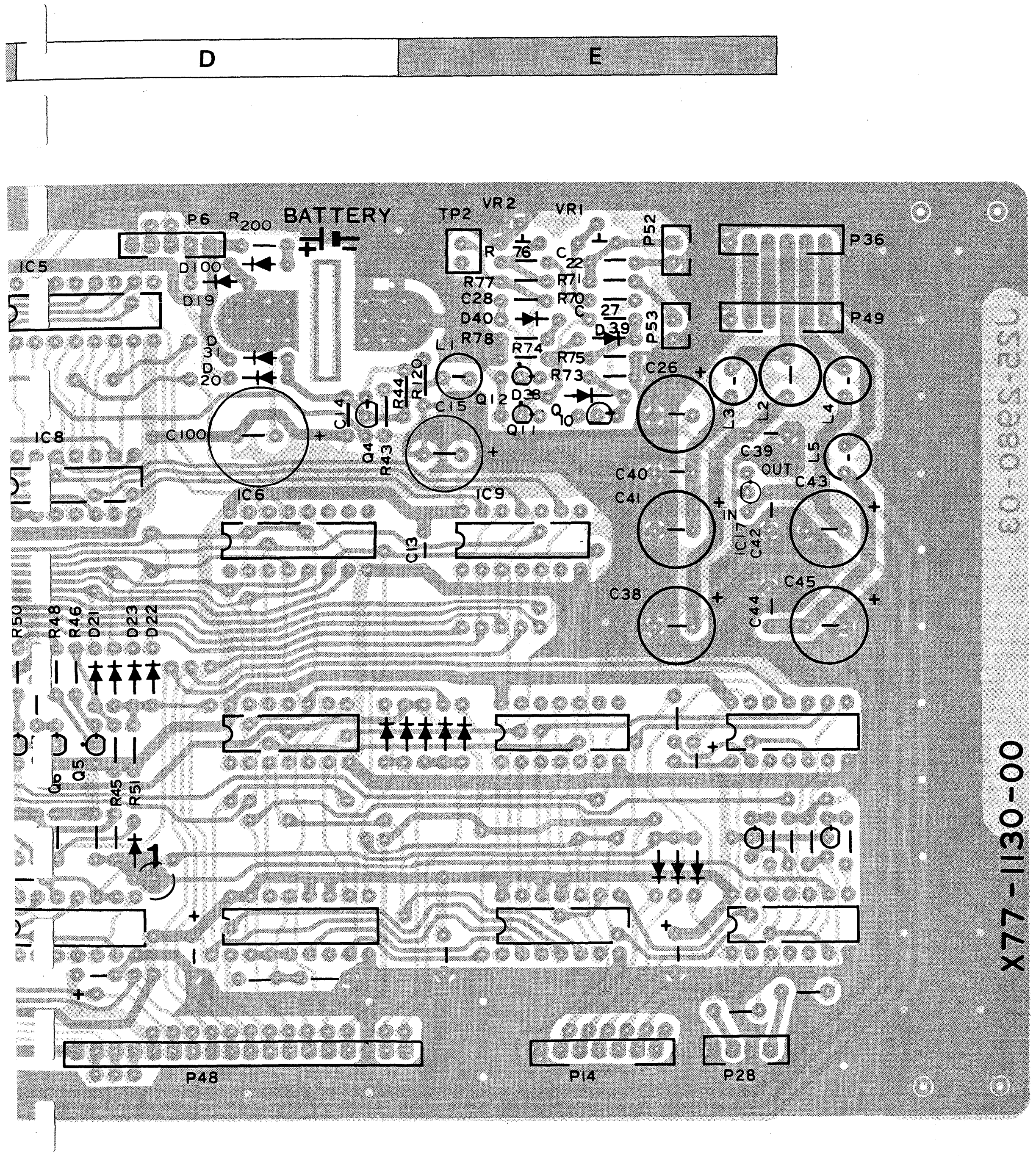
PC BOARD

X77-1130-01

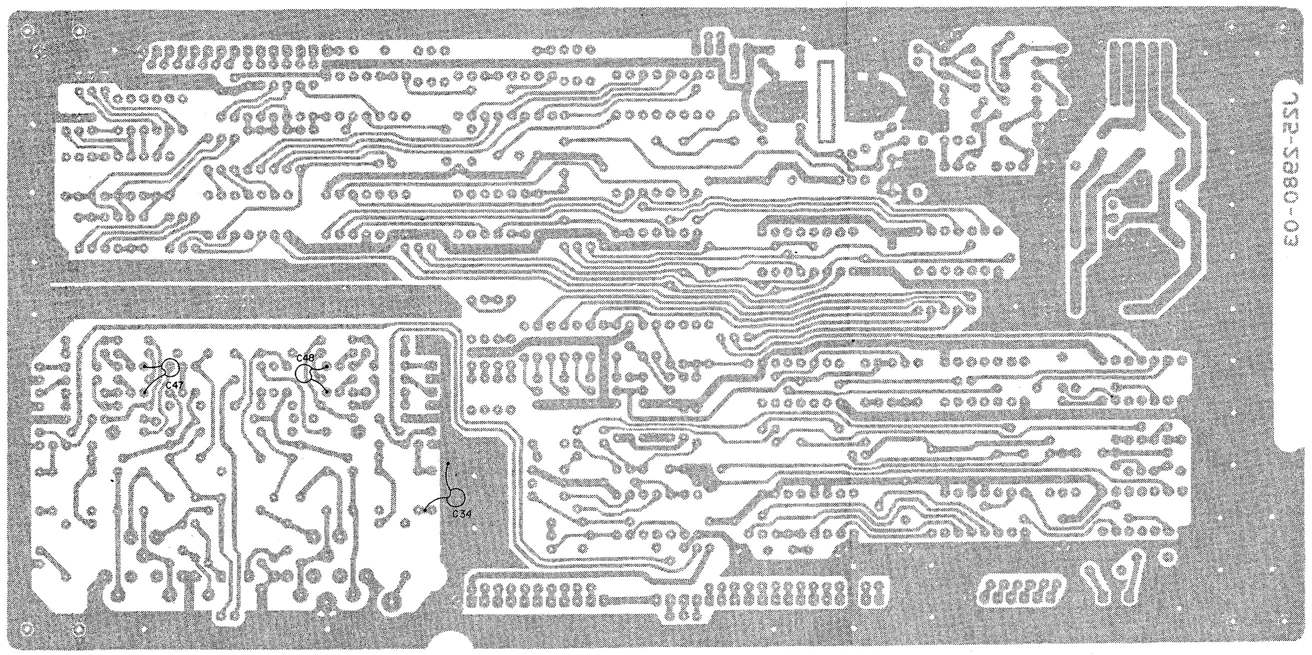

A
B
C
D
E
1
2
3
X77-1130-00
J25-2980-03
BATTERY
P55
P6
P36
P49
P52
P53
P11
P12
P56
P54
P48
P14
P28
TP1
TP2
VR1
VR2
IC1
IC2
IC3
IC4
IC5
IC6
IC7
IC8
IC9
C100
C26
C38
C40
C41
C43
C45
C49
L1
L2
L3
L4
L5
RL1
RL2
TC1
TC4
Q17
Q13
OUT
1
2

X77-113

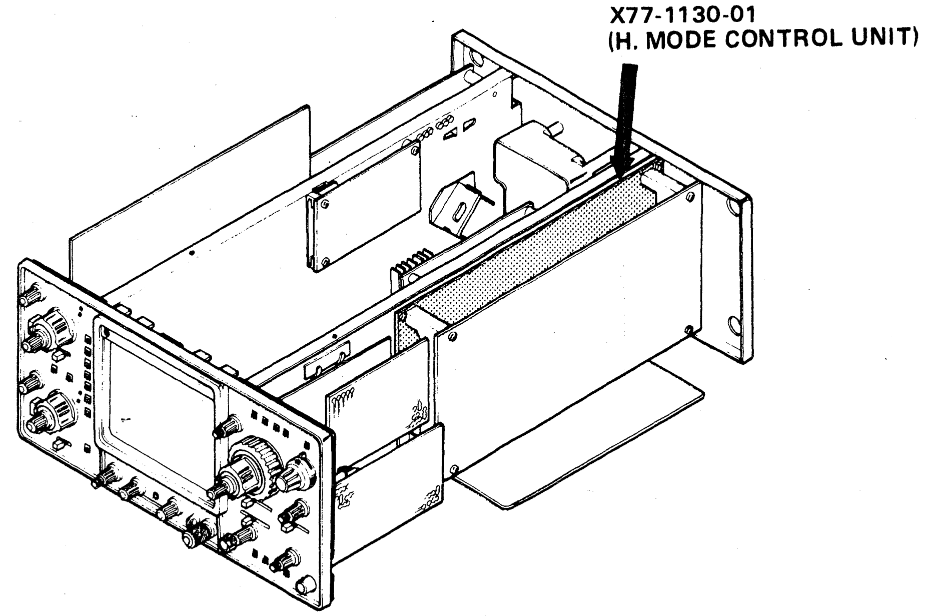



D
E
P6
R200
BATTERY
TP2
VR2
VR1
P52
P36
IC5
D100
D19
D31
D20
R77
C28
D40
R78
R71
R70
C22
C27
D39
P53
P49
R74
R75
R73
R44
R120
C14
C15
Q12
D38
Q10
C26
L3
L2
L4
L5
C100
Q4
R43
IC8
IC6
IC9
C13
C39
OUT
C40
C41
C43
IN
IC17
C42
C38
C44
C45
R50
R48
R46
D21
D23
D22
Q6
Q5
R45
R51
P48
P14
P28
X77-1130-00

X77-1130-01

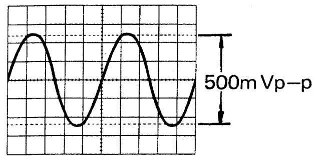


(Foil Side View)

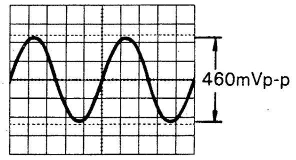

X77-1130-01
(H. MODE CONTROL UNIT)

WAVEFORMS

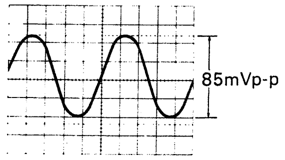
①



②③④

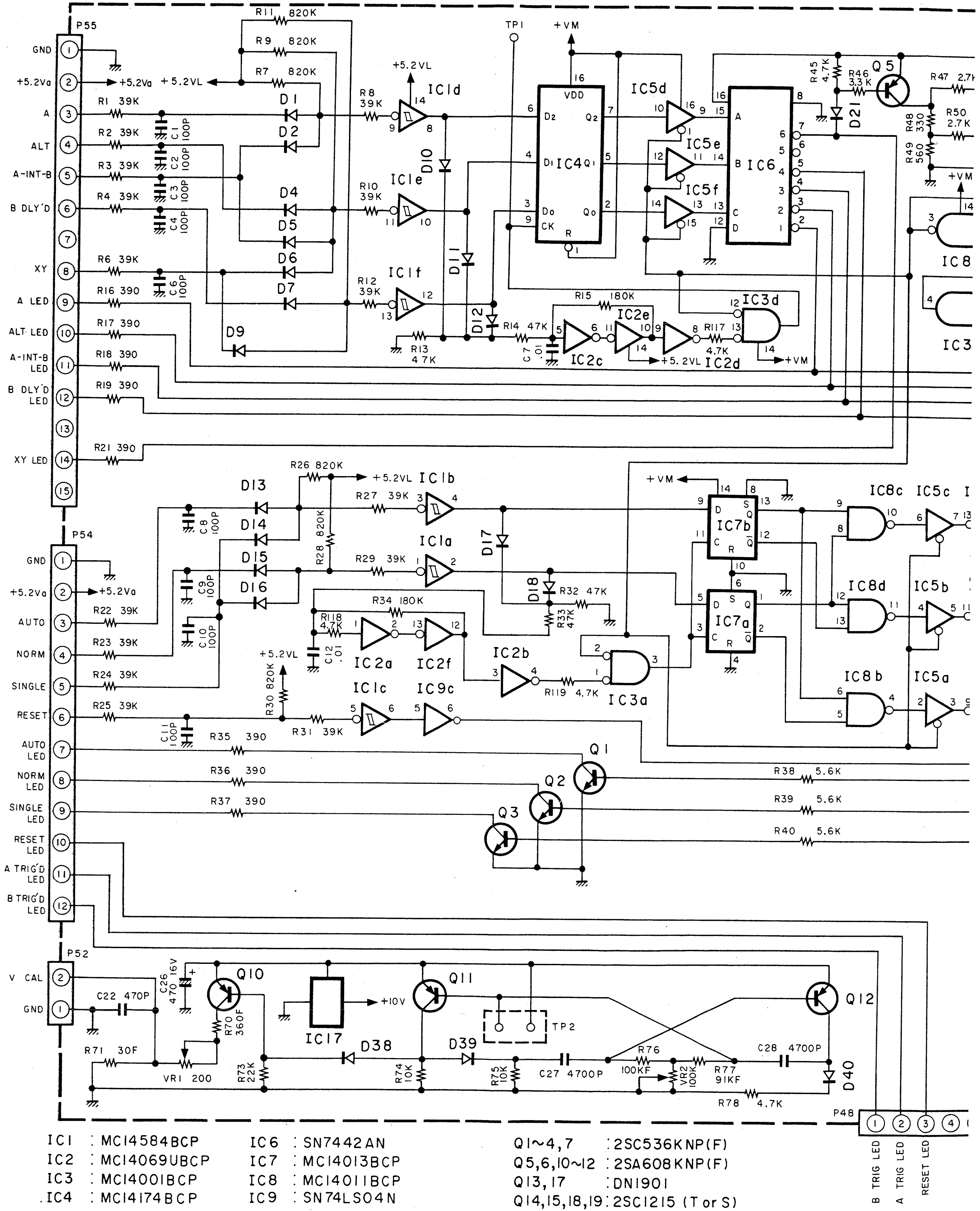


⑤



SCHEMATIC DIA

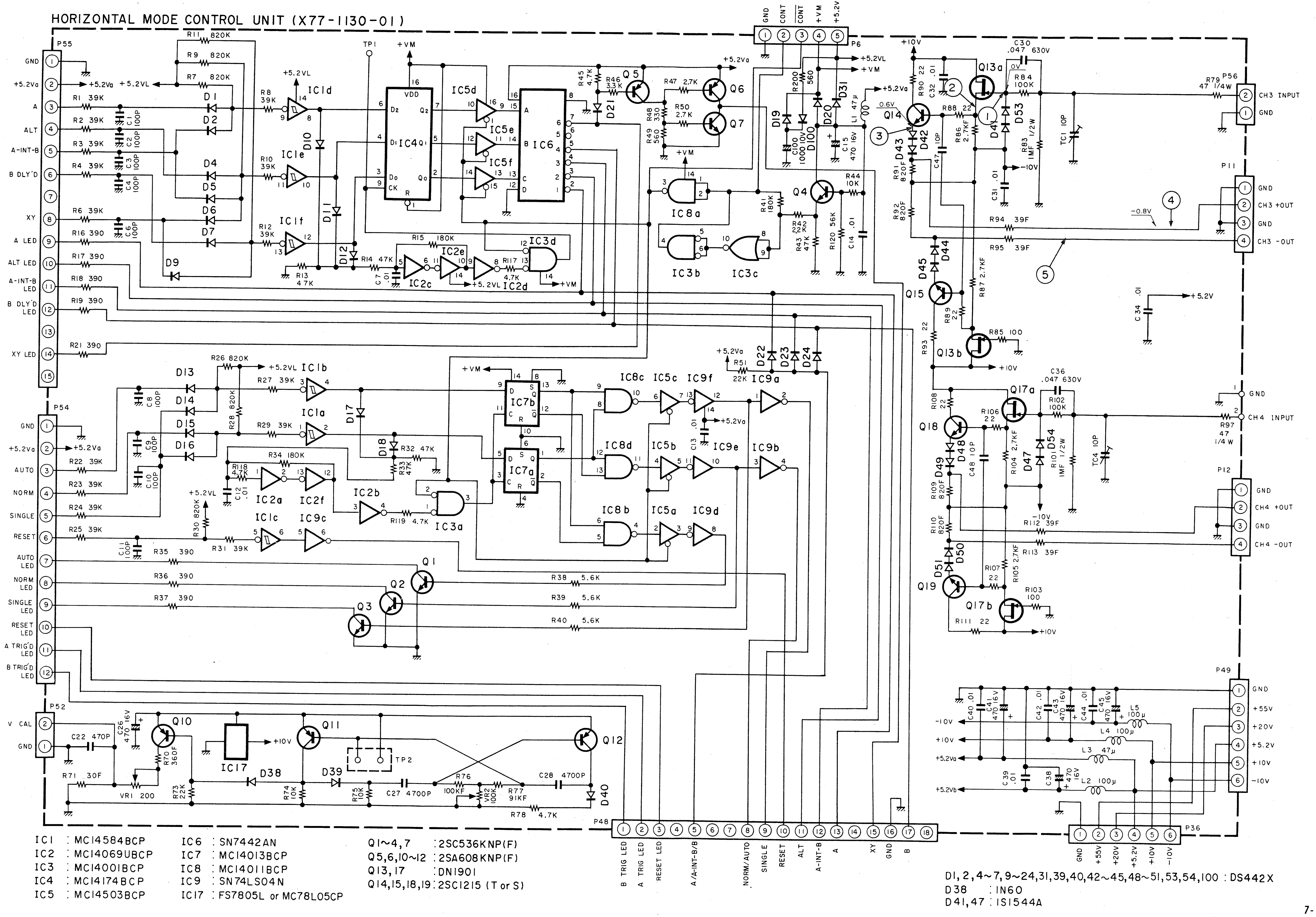
HORIZONTAL MODE CONTROL UNIT (X77-1130-01)


P55
GND
+5.2Va
A
ALT
A-INT-B
B DLY'D
XY
A LED
ALT LED
A-INT-B LED
B DLY'D LED
XY LED
P54
GND
+5.2Va
AUTO
NORM
SINGLE
RESET
AUTO LED
NORM LED
SINGLE LED
RESET LED
A TRIG'D LED
B TRIG'D LED
P52
V CAL
GND
TP1
TP2
+VM
+5.2VL
IC1a
IC1b
IC1c
IC1d
IC1e
IC1f
IC2a
IC2b
IC2c
IC2d
IC2e
IC2f
IC3a
IC3d
IC4
IC5a
IC5b
IC5c
IC5d
IC5e
IC5f
IC6
IC7a
IC7b
IC8b
IC8c
IC8d
IC9c
IC17
Q1
Q2
Q3
Q5
Q10
Q11
Q12
+10V
P48
B TRIG LED
A TRIG LED
RESET LED

IC1	: MC14584BCP	IC6	: SN7442AN	Q1~4,7	: 2SC536KNP(F)
IC2	: MC14069UBCP	IC7	: MC14013BCP	Q5,6,10~12	: 2SA608KNP(F)
IC3	: MC14001BCP	IC8	: MC14011BCP	Q13,17	: DN1901
IC4	: MC14174BCP	IC9	: SN74LS04N	Q14,15,18,19	: 2SC1215 (T or S)
IC5	: MC14503BCP	IC17	: FS7805L or MC78L05CP		

SCHEMATIC DIAGRAM

HORIZONTAL MODE CONTROL UNIT (X77-1130-01)


P55
GND
+5.2Va
A
ALT
A-INT-B
B DLY'D
XY
A LED
ALT LED
A-INT-B LED
B DLY'D LED
XY LED
P54
GND
+5.2Va
AUTO
NORM
SINGLE
RESET
AUTO LED
NORM LED
SINGLE LED
RESET LED
A TRIG'D LED
B TRIG'D LED
P52
V CAL
GND
P6
GND
CONT
CONT
+VM
+5.2VL
P56
CH3 INPUT
GND
P11
GND
CH3 +OUT
GND
CH3 -OUT
CH4 INPUT
P12
GND
CH4 +OUT
GND
CH4 -OUT
P49
GND
+55V
+20V
+5.2V
+10V
-10V
P48
B TRIG LED
A TRIG LED
RESET LED
A/A-INT-B/B
NORM/AUTO
SINGLE
RESET
ALT
A-INT-B
A
XY
GND
B
P36
GND
+55V
+20V
+5.2V
+10V
-10V
TP1
TP2
IC1a
IC1b
IC1c
IC1d
IC1e
IC1f
IC2a
IC2b
IC2c
IC2d
IC2e
IC2f
IC3a
IC3b
IC3c
IC3d
IC4
IC5a
IC5b
IC5c
IC5d
IC5e
IC5f
IC6
IC7a
IC7b
IC8a
IC8b
IC8c
IC8d
IC9a
IC9b
IC9c
IC9d
IC9e
IC9f
IC17
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q10
Q11
Q12
Q13a
Q13b
Q14
Q15
Q17a
Q17b
Q18
Q19
0.6V
0V
-0.8V
①
②
③
④
⑤

IC1 : MC14584BCP
IC2 : MC14069UBCP
IC3 : MC14001BCP
IC4 : MC14174BCP
IC5 : MC14503BCP

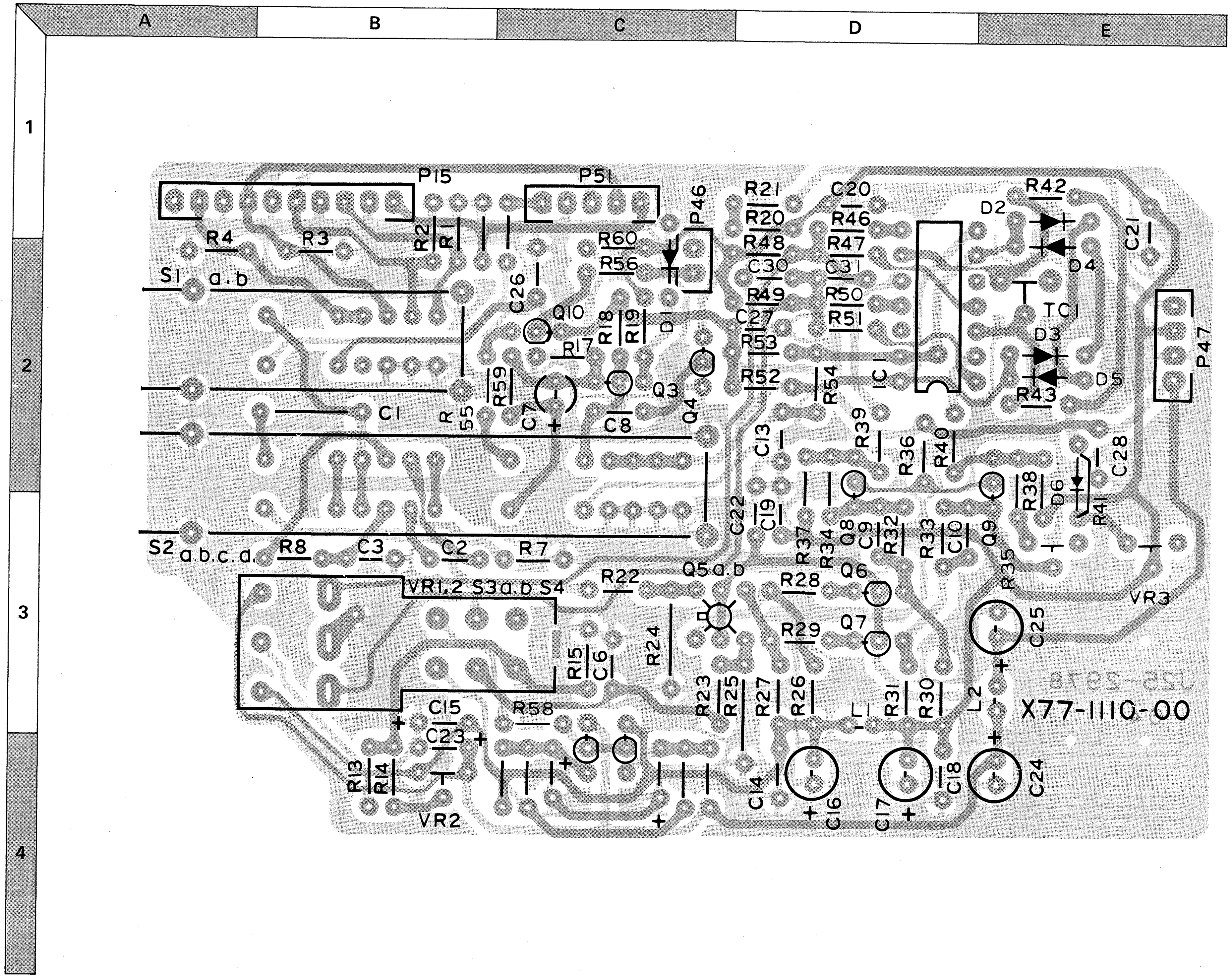
IC6 : SN7442AN
IC7 : MC14013BCP
IC8 : MC14011BCP
IC9 : SN74LS04N
IC17 : FS7805L or MC78L05CP

Q1~4,7 : 2SC536KNP(F)
Q5,6,10~12 : 2SA608KNP(F)
Q13,17 : DN1901
Q14,15,18,19 : 2SC1215 (T or S)

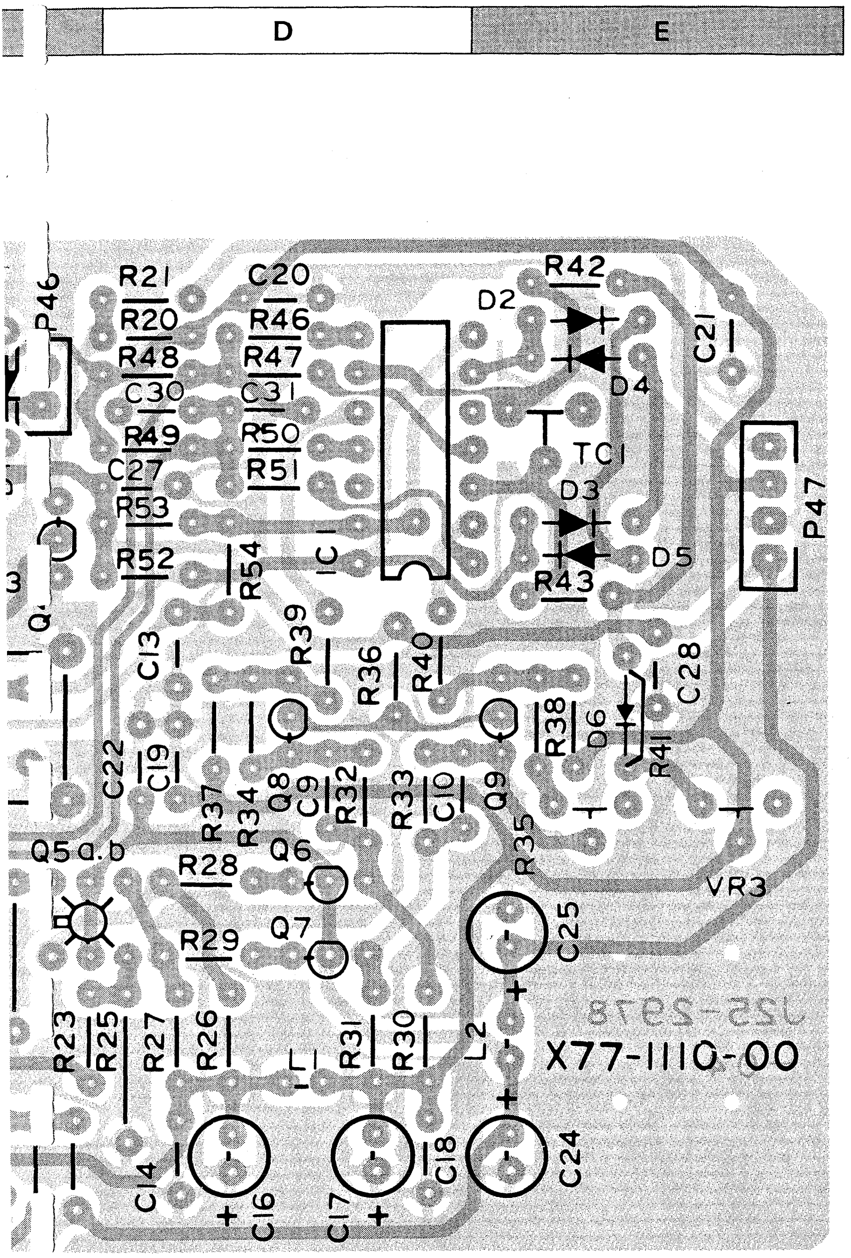
D1,2,4~7,9~24,31,39,40,42~45,48~51,53,54,100 : DS442X
D38 : IN60
D41,47 : IS1544A

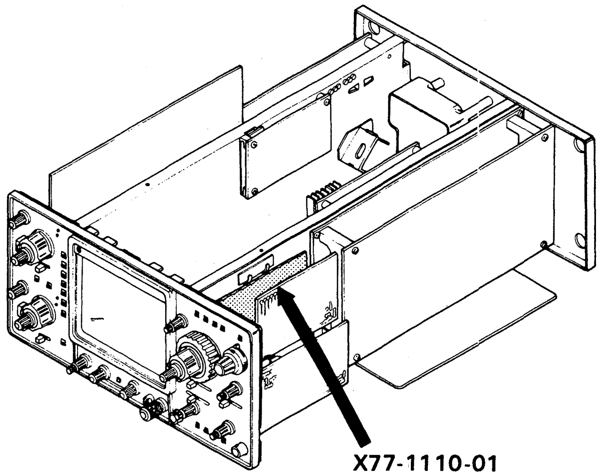
PC BOARD

X77-1110-01


A
B
C
D
E
1
2
3
4
P15
P51
P46
R21
C20
R42
D2
C21
R4
R3
R2
R1
R60
R56
R20
R48
C30
R46
R47
C31
D4
S1
a.b
C26
Q10
R18
R19
D1
R49
C27
R50
R51
TC1
D3
P47
R17
R53
R52
R54
IC1
D5
R43
R59
C7
Q3
Q4
C1
R55
C8
C13
R39
R36
R40
C28
R38
D6
R41
C22
C19
R37
R34
Q8
C9
R32
R33
C10
Q9
R35
S2
a.b.c.d.
R8
C3
C2
R7
VR1.2
S3a.b
S4
R22
Q5a.b
R28
Q6
VR3
R24
R29
Q7
C25
R15
C6
R23
R25
R27
R26
L1
R31
R30
L2
X77-1110-00
C15
R58
C23
R13
R14
VR2
C14
C16
C17
C18
C24

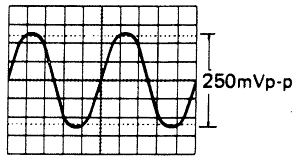
BOARD


D
E
R21
C20
R42
D2
R20
R46
R48
R47
C30
C31
D4
C21
P46
R49
R50
C27
R51
TC1
D3
P47
R53
R54
IC1
R52
D5
R43
Q
R39
R36
R40
C13
C28
D6
R38
R41
C22
C19
R37
R34
Q8
C9
R32
R33
C10
Q9
R35
Q5 a.b
R28
Q6
VR3
R29
Q7
C25
R23
R25
R27
R26
L1
R31
R30
L2
X77-1110-00
C14
C16
C17
C18
C24

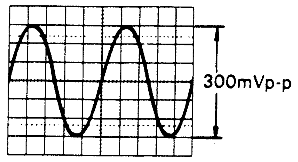

X77-1110-01
(A TRIG UNIT)

WAVEFORMS

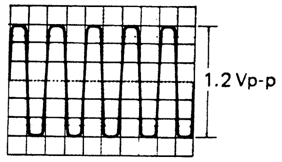
①



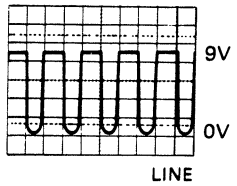
②



③

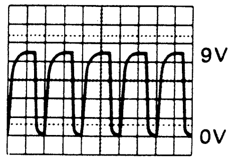


④-1



LINE

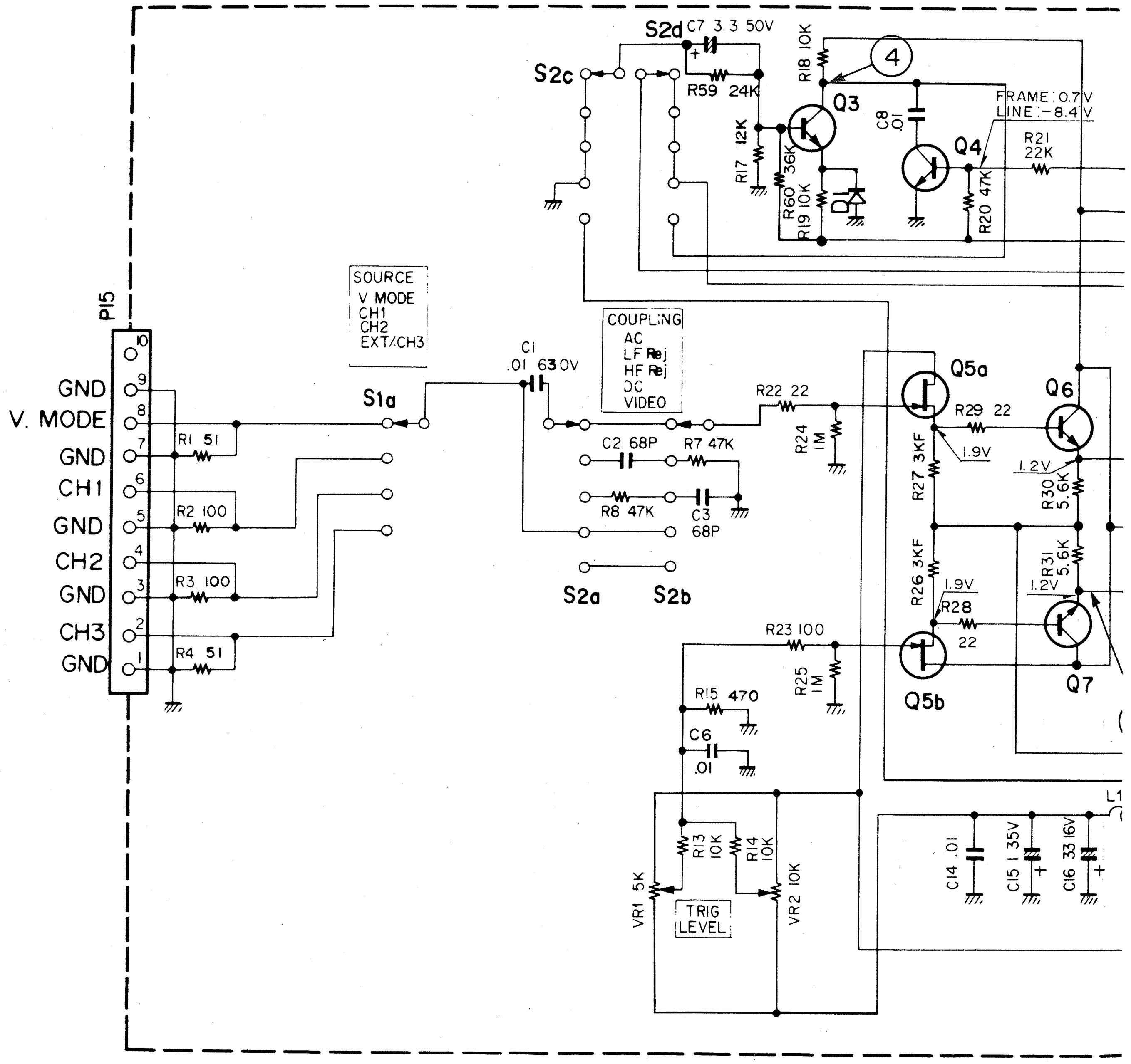
④-2



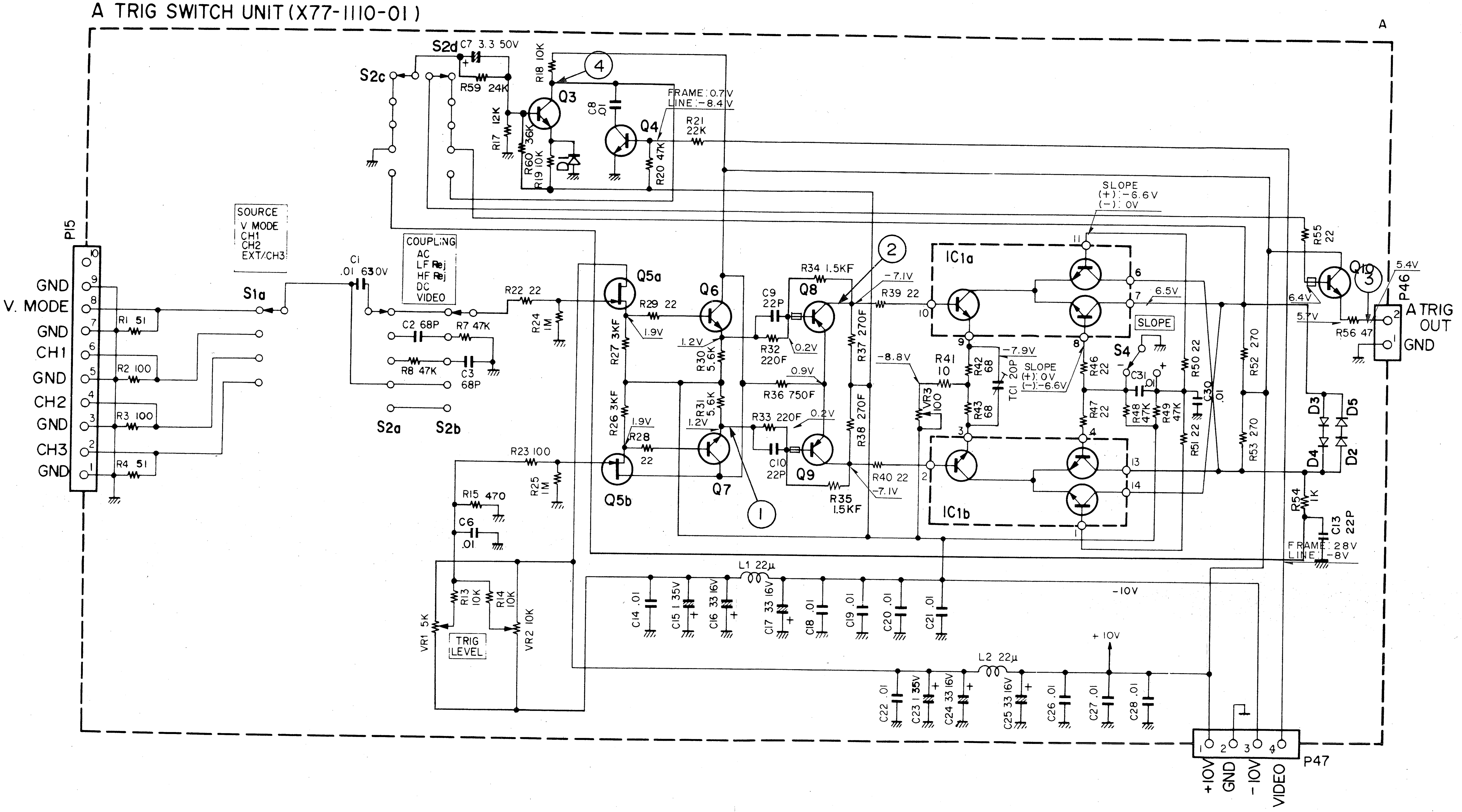
FRAME

SCHEMATIC

A TRIG SWITCH UNIT (X77-1110-01)


P15
GND
V. MODE
GND
CH1
GND
CH2
GND
CH3
GND
R1 51
R2 100
R3 100
R4 51
SOURCE
V MODE
CH1
CH2
EXT/CH3
S1a
C1
.01 630V
COUPLING
AC
LF Rej
HF Rej
DC
VIDEO
C2 68P
R7 47K
R8 47K
C3 68P
S2a
S2b
S2c
S2d
C7 3.3 50V
R59 24K
R17 12K
R18 10K
R60 36K
R19 10K
Q3
④
C8 .01
Q4
FRAME: 0.7V
LINE: -8.4V
R20 47K
R21 22K
R22 22
R24 1M
Q5a
R29 22
Q6
1.9V
1.2V
R27 3KF
R30 5.6K
R26 3KF
R31 5.6K
1.9V
1.2V
R28 22
Q7
R23 100
R25 1M
Q5b
R15 470
C6 .01
R13 10K
R14 10K
VR1 5K
VR2 10K
TRIG LEVEL
C14 .01
C15 1 35V
C16 33 16V
L1

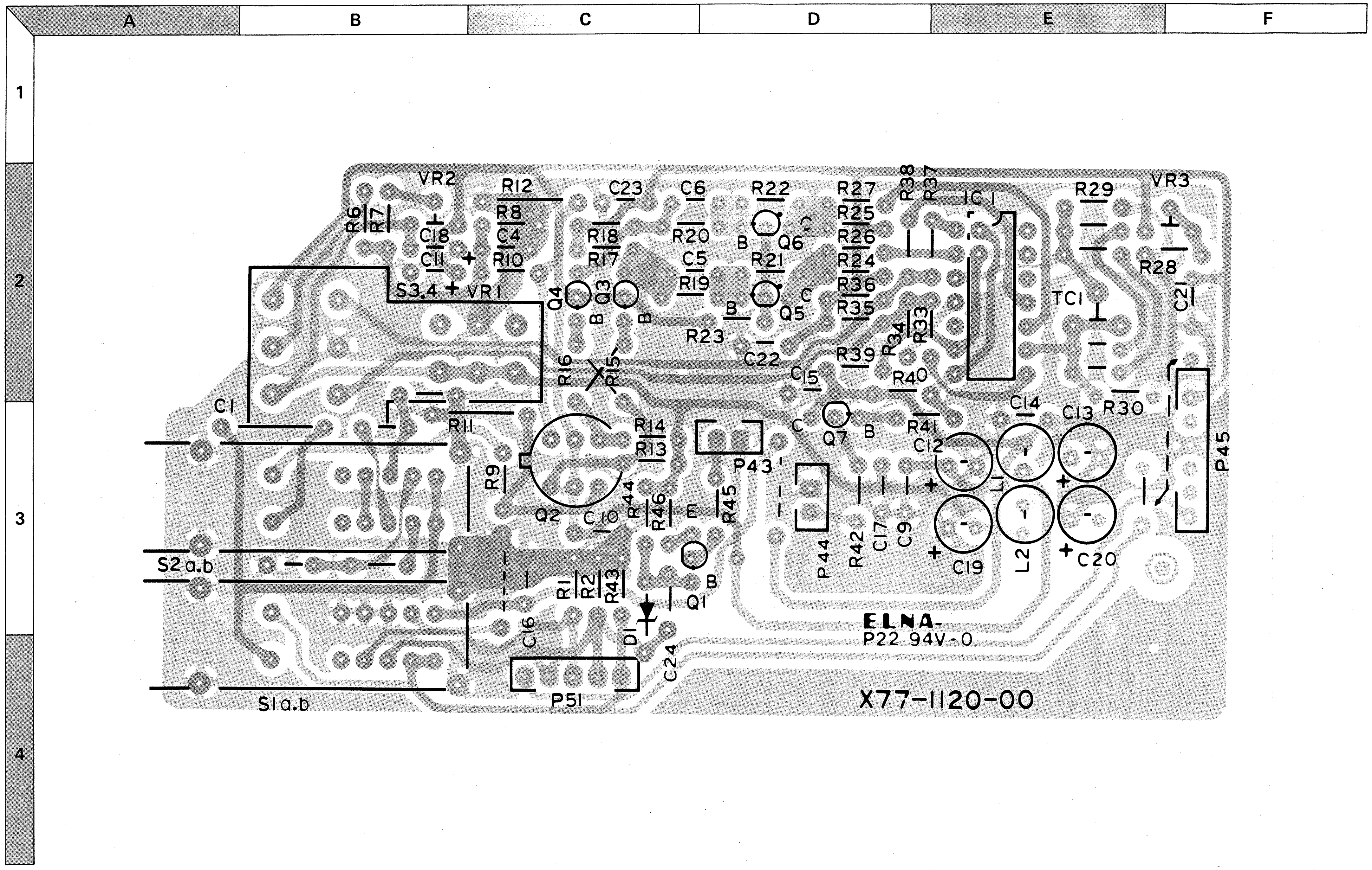
SCHEMATIC DIAGRAM


A TRIG SWITCH UNIT (X77-1110-01)
A
P15
GND
V. MODE
GND
CH1
GND
CH2
GND
CH3
GND
R1 51
R2 100
R3 100
R4 51
SOURCE
V MODE
CH1
CH2
EXT/CH3
S1a
C1 .01 630V
COUPLING
AC
LF Rej
HF Rej
DC
VIDEO
C2 68P
R7 47K
R8 47K
C3 68P
S2a
S2b
S2c
S2d
C7 3.3 50V
R59 24K
R18 10K
R17 12K
R60 36K
R19 10K
Q3
C8 .01
Q4
FRAME: 0.7V
LINE: -8.4V
R21 22K
R20 47K
4
R22 22
R24 1M
Q5a
R29 22
1.9V
R27 3KF
R26 3KF
1.9V
R28 22
Q5b
R23 100
R25 1M
R15 470
C6 .01
R13 10K
R14 10K
VR1 5K
TRIG LEVEL
VR2 10K
Q6
Q7
1.2V
1.2V
R30 5.6K
R31 5.6K
1
C9 22P
R32 220F
0.2V
R34 1.5KF
2
Q8
-7.1V
R36 750F
0.9V
R33 220F
0.2V
C10 22P
Q9
R35 1.5KF
R37 270F
R38 270F
R39 22
R40 22
-7.1V
-8.8V
VR3 100
R41 10
R42 68
R43 68
TC1 20P
-7.9V
SLOPE
(+): 0V
(-): -6.6V
IC1a
IC1b
SLOPE
(+): -6.6V
(-): 0V
6.5V
SLOPE
S4
C31 .01
R46 22
R47 22
R48 47K
R49 47K
R50 22
R51 22
C30 .01
R52 270
R53 270
R55 22
Q10
3
6.4V
5.7V
5.4V
R56 47
P46
A TRIG OUT
GND
D3
D5
D4
D2
R54 1K
C13 22P
FRAME: 28V
LINE: -8V
L1 22μ
-10V
C14 .01
C15 1 35V
C16 33 16V
C17 33 16V
C18 .01
C19 .01
C20 .01
C21 .01
+10V
L2 22μ
C22 .01
C23 1 35V
C24 33 16V
C25 33 16V
C26 .01
C27 .01
C28 .01
P47
+10V
GND
-10V
VIDEO

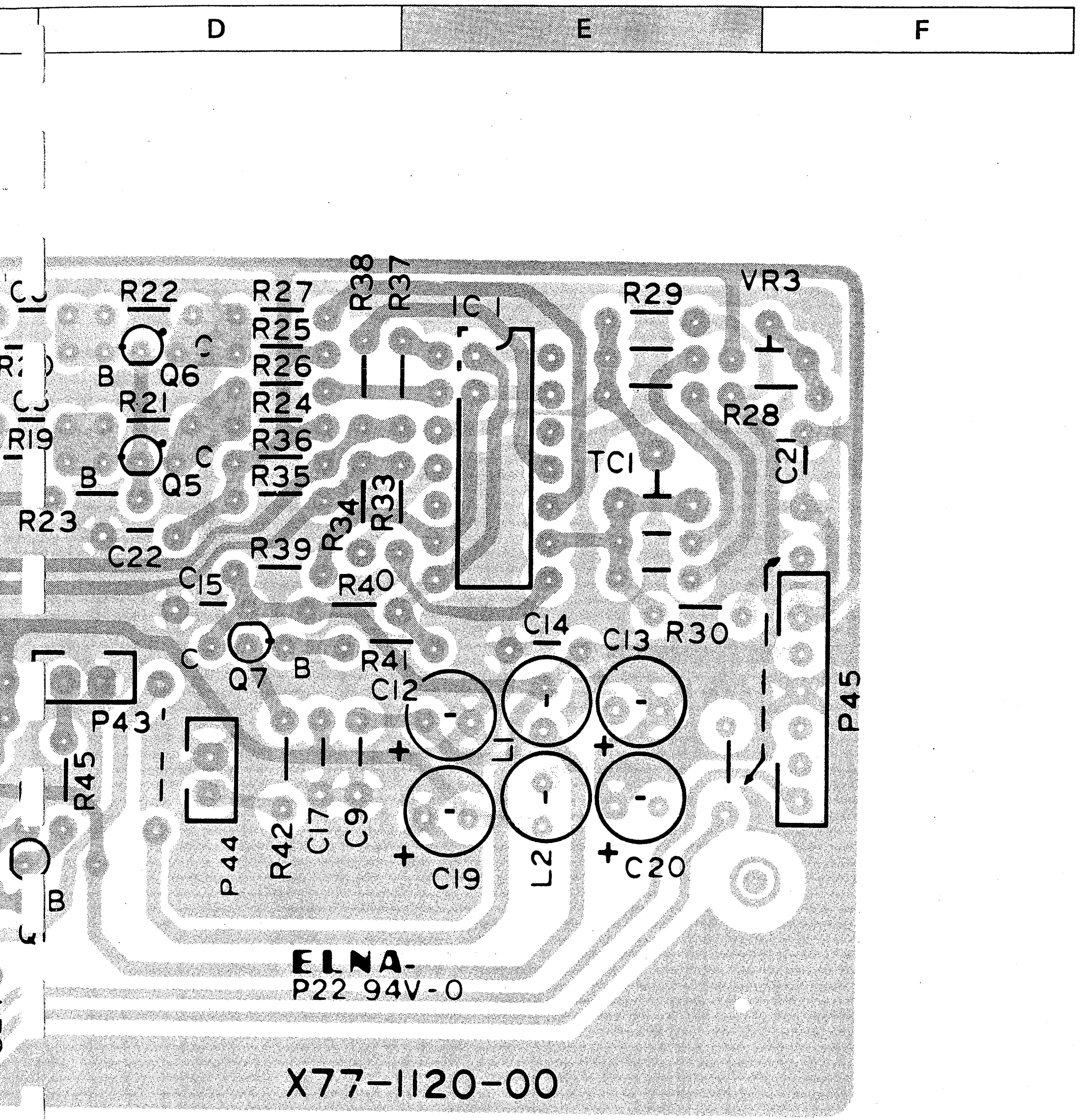
IC1	:CA3102E
Q3,4	:2SC536KNP(F)
Q5	:DN1901
Q6,7	:2SC1215(T or S)
Q8,9	:2SA1161
Q10	:2SC2671
D1~5	:DS442X

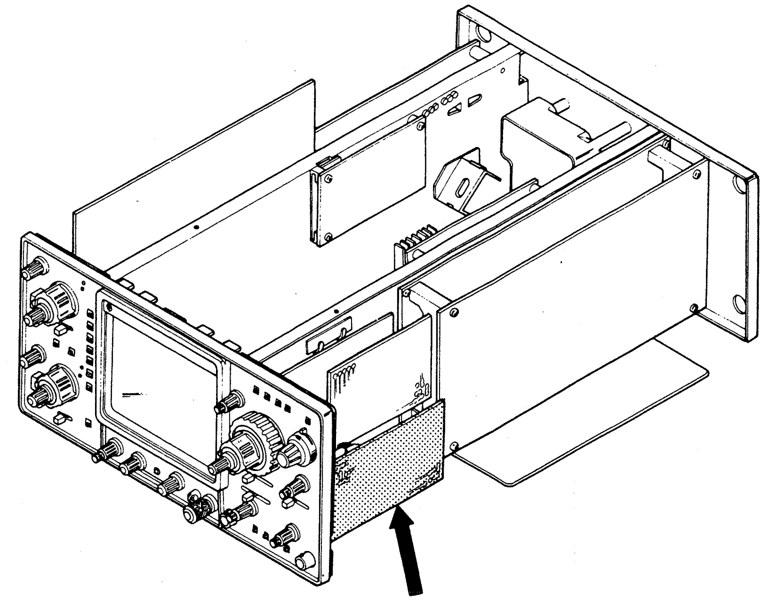
PC BOARD

X77-1120-01


A
B
C
D
E
F
1
2
3
4
VR2
R6
R7
C18
C11
R12
R8
C4
R10
S3.4
VR1
C23
R18
R17
Q4
Q3
B
C6
R20
C5
R19
R22
Q6
R21
Q5
R23
C22
R27
R25
R26
R24
R36
R35
R38
R37
IC1
R34
R33
R39
R40
C15
Q7
C
R41
R29
VR3
R28
TC1
C21
R30
C14
C13
C12
L1
P45
C1
R11
R16
R15
R14
R13
P43
R9
Q2
C10
R44
R46
E
R45
P44
R42
C17
C9
C19
L2
C20
S2 a.b
R1
R2
R43
Q1
C16
D1
C24
P51
S1 a.b
ELNA
P22 94V-0
X77-1120-00

BOARD

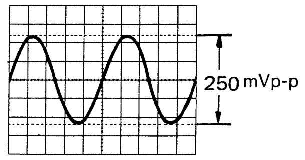

D
E
F
R22
R27
R25
R26
R24
R36
R35
R38
R37
IC1
R29
VR3
Q6
R21
Q5
R19
R23
C22
C15
R39
R34
R33
R40
TC1
R28
C21
Q7
R41
C12
C14
C13
R30
P45
P43
P44
R45
R42
C17
C9
C19
L1
L2
C20
ELNA
P22 94V-0
X77-1120-00



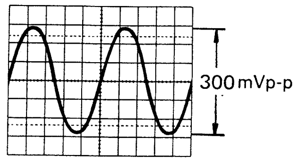
X77-1120-01
(B TRIG UNIT)

WAVEFORMS

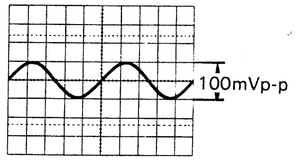
①③④



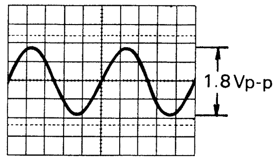
②



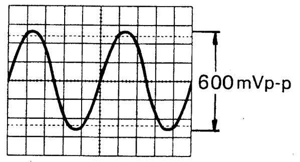
⑥



⑦

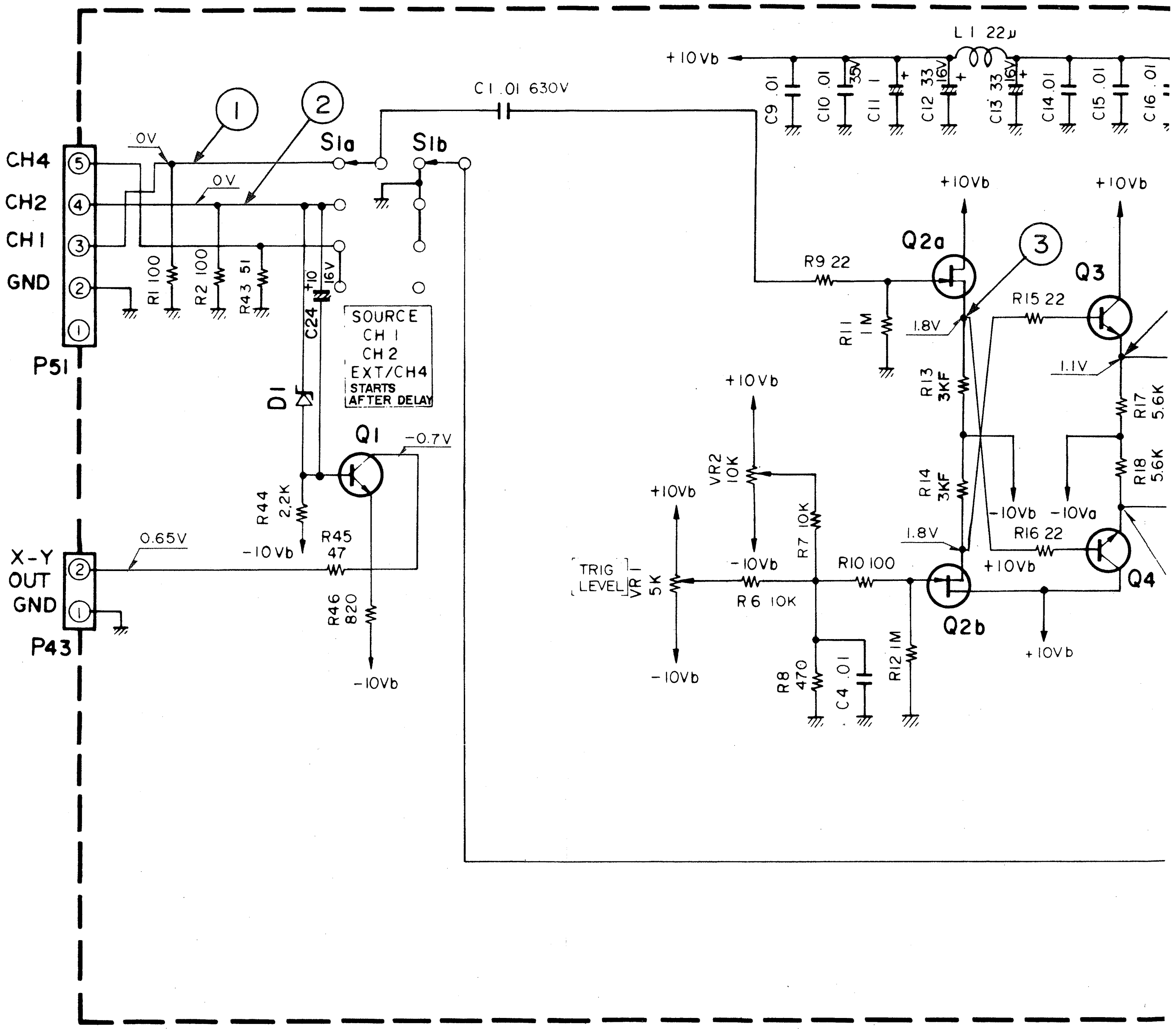


⑤⑧



SCHEMATIC

B TRIG SWITCH UNIT (X77-1120-01)


CH4
CH2
CH1
GND
P51
X-Y OUT
GND
P43
0V
0V
0.65V
R1 100
R2 100
R43 51
C24 10 16V
D1
R44 2.2K
-10Vb
R45 47
R46 820
-10Vb
Q1
-0.7V
S1a
S1b
SOURCE
CH1
CH2
EXT/CH4
STARTS AFTER DELAY
C1 .01 630V
+10Vb
L1 22μ
C9 .01
C10 .01
C11 1 35V
C12 33 16V
C13 33 16V
C14 .01
C15 .01
C16 .01
+10Vb
+10Vb
R9 22
Q2a
R11 1M
1.8V
R13 3KF
R14 3KF
1.8V
Q3
R15 22
1.1V
R17 5.6K
R18 5.6K
-10Vb
-10Va
R16 22
+10Vb
Q4
Q2b
+10Vb
+10Vb
VR2 10K
+10Vb
-10Vb
R7 10K
R10 100
TRIG LEVEL VR 5K
R6 10K
-10Vb
R8 470
C4 .01
R12 1M

IC1 : CA3102E

Q1,3,4 : 2SC1215TorS

Q2 : DN1901

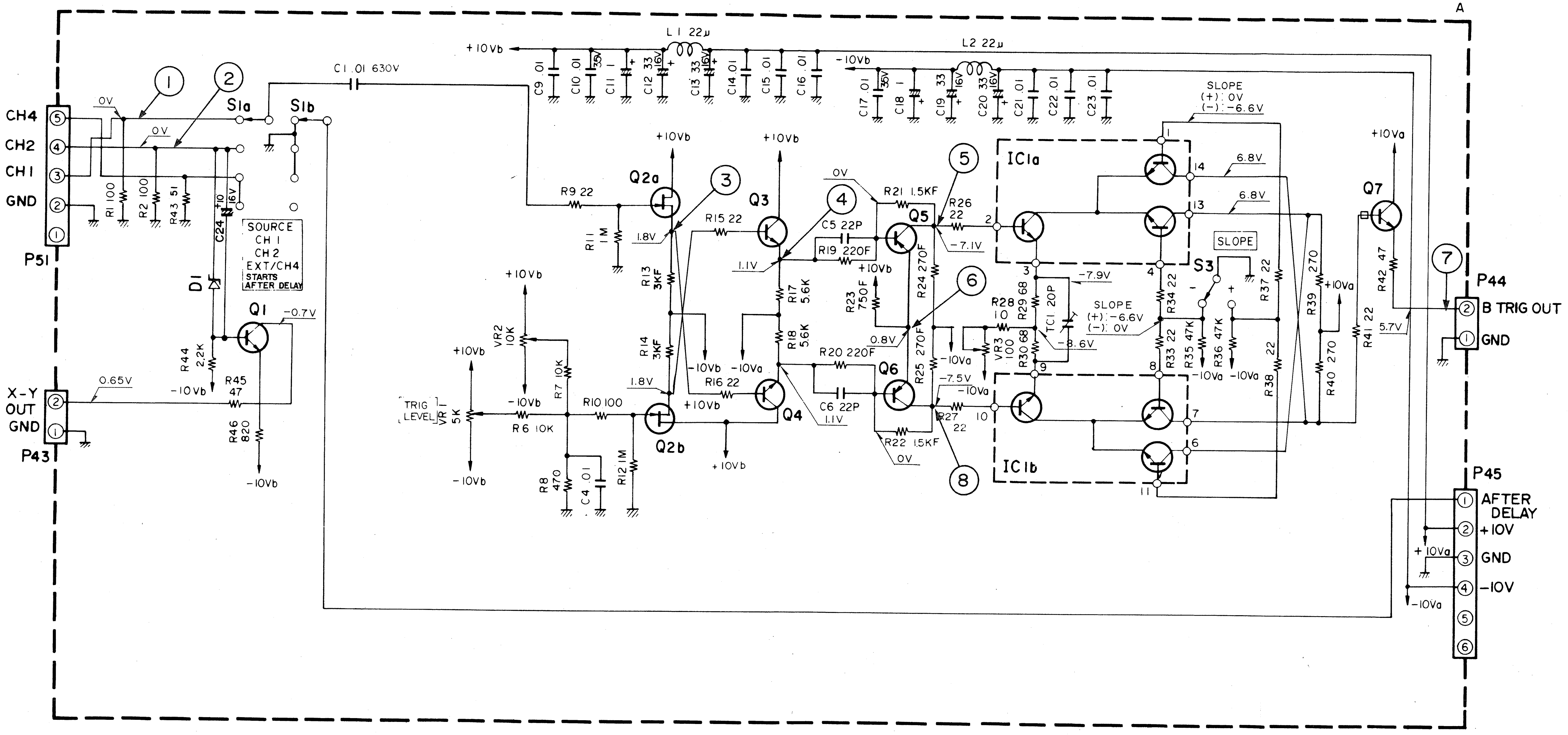
Q7 : 2SC2499

Q5,6 : 2SA1161

D1 : WZ-081

SCHEMATIC DIAGRAM

B TRIG SWITCH UNIT (X77-1120-01)


A
+10Vb
L1 22μ
L2 22μ
-10Vb
C1 .01 630V
C9 .01
C10 .01
C11 1
C12 33 16V
C13 33 16V
C14 .01
C15 .01
C16 .01
C17 .01 35V
C18 1
C19 33 16V
C20 33 16V
C21 .01
C22 .01
C23 .01
CH4
CH2
CH1
GND
P51
0V
S1a
S1b
R1 100
R2 100
R43 51
C24 10 16V
SOURCE
CH 1
CH 2
EXT/CH4
STARTS AFTER DELAY
D1
Q1
-0.7V
R44 2.2K
-10Vb
R45 47
R46 820
X-Y OUT
GND
P43
0.65V
R9 22
Q2a
R11 1M
1.8V
R13 3KF
R14 3KF
Q2b
R15 22
Q3
1.1V
R16 22
Q4
R17 5.6K
R18 5.6K
-10Va
C5 22P
R19 220F
R20 220F
C6 22P
R21 1.5KF
R22 1.5KF
R23 750F
R24 270F
R25 270F
R26 22
R27 22
Q5
Q6
-7.1V
-7.5V
0.8V
VR2 10K
R7 10K
R10 100
R6 10K
TRIG LEVEL VR1 5K
R8 470
C4 .01
R12 1M
IC1a
IC1b
SLOPE (+): 0V (-): -6.6V
6.8V
SLOPE
S3
-7.9V
-8.6V
SLOPE (+): -6.6V (-): 0V
R28 10
R29 68
R30 68
VR3 100
TC1 20P
R33 22
R34 22
R35 47K
R36 47K
R37 22
R38 22
R39 270
R40 270
R41 22
R42 47
Q7
+10Va
5.7V
P44
B TRIG OUT
GND
P45
AFTER DELAY
+10V
GND
-10V
①
②
③
④
⑤
⑥
⑦
⑧

IC1 : CA3102E

Q1,3,4 : 2SC1215T or S

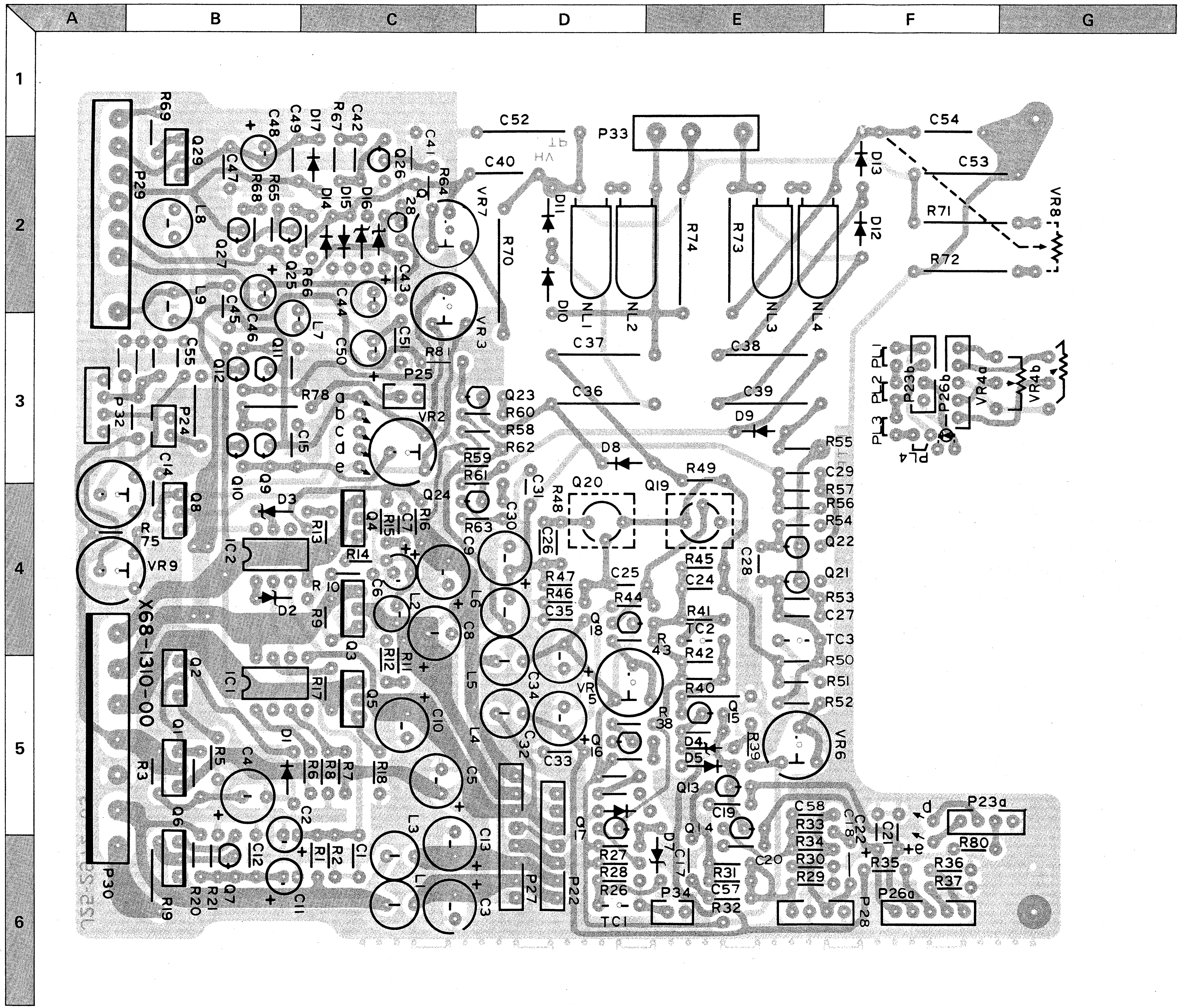
Q2 : DN1901

Q7 : 2SC2499

Q5,6 : 2SA1161

D1 : WZ-081

PC BOARD


A
B
C
D
E
F
G
1
2
3
4
5
6
X68-1310-00
P29
P30
P32
P24
P25
P33
P34
P27
P22
P28
P23a
P23b
P26a
P26b
PL1
PL2
PL3
PL4
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
Q19
Q20
Q21
Q22
Q23
Q24
Q25
Q26
Q27
Q28
Q29
IC1
IC2
VR2
VR3
VR4a
VR4b
VR5
VR6
VR7
VR8
VR9
NL1
NL2
NL3
NL4
HV
TC1
TC2
TC3
L1
L2
L3
L4
L5
L6
L7
L8
L9
D1
D2
D3
D4
D5
D7
D8
D9
D10
D11
D12
D13
D14
D15
D16
D17
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C17
C18
C19
C20
C21
C22
C24
C25
C26
C27
C28
C29
C30
C31
C32
C33
C34
C35
C36
C37
C38
C39
C40
C41
C42
C43
C44
C45
C46
C47
C48
C49
C50
C51
C52
C53
C54
C55
C57
C58
R1
R2
R3
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
R39
R40
R41
R42
R43
R44
R45
R46
R47
R48
R49
R50
R51
R52
R53
R54
R55
R56
R57
R58
R59
R60
R61
R62
R63
R64
R65
R66
R67
R68
R69
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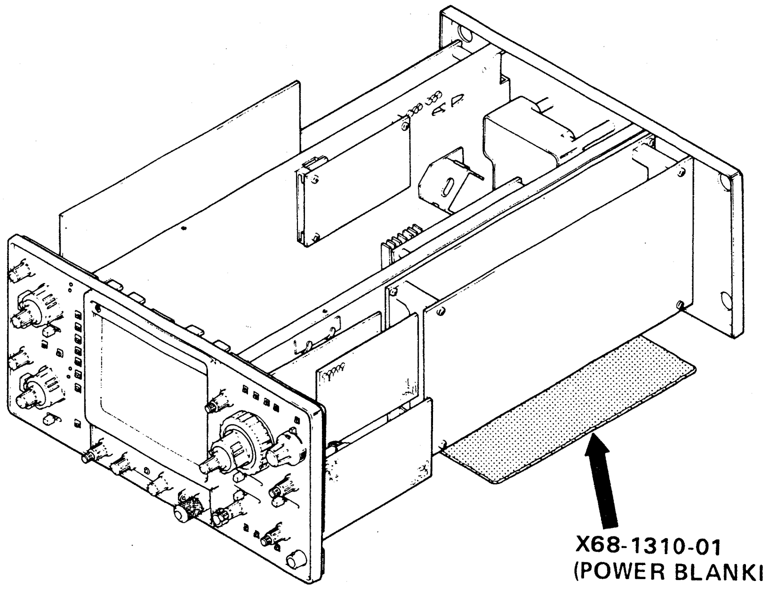
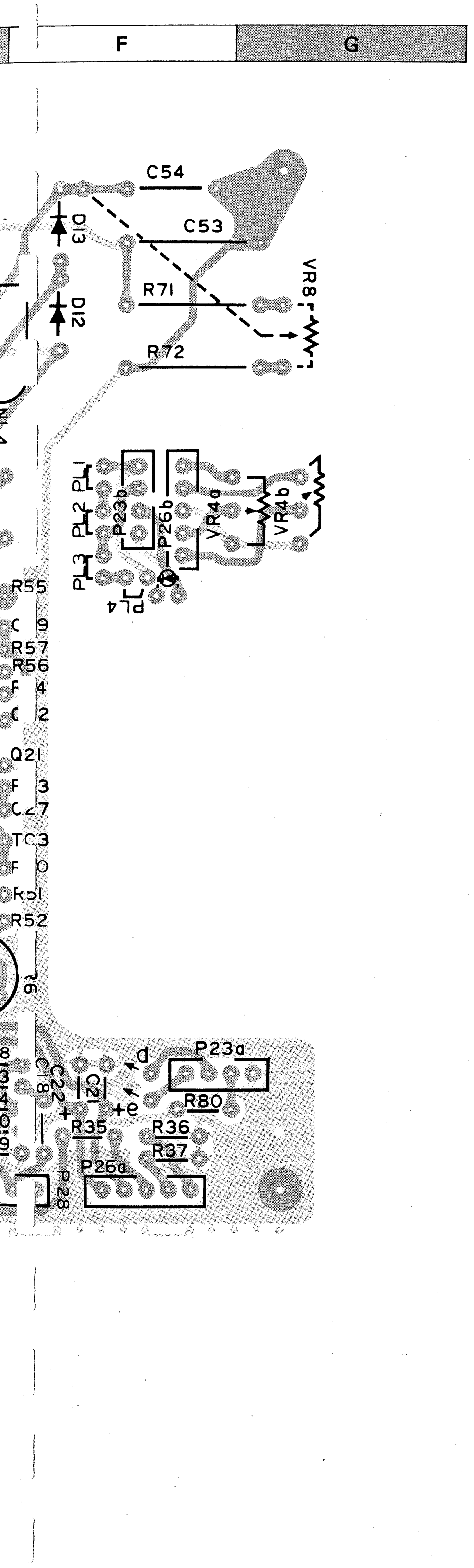
R71
R72
R73
R74
R75
R78
R80
R81
a
b
c
d
e

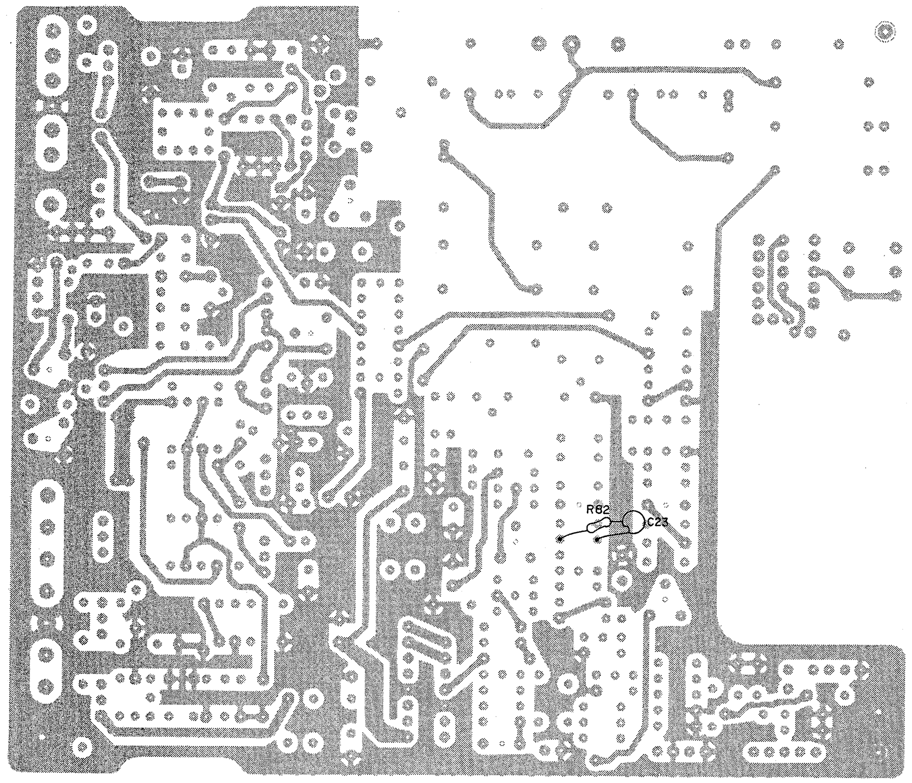

X68-1310-01
(POWER BLANKING UNIT)

OARD

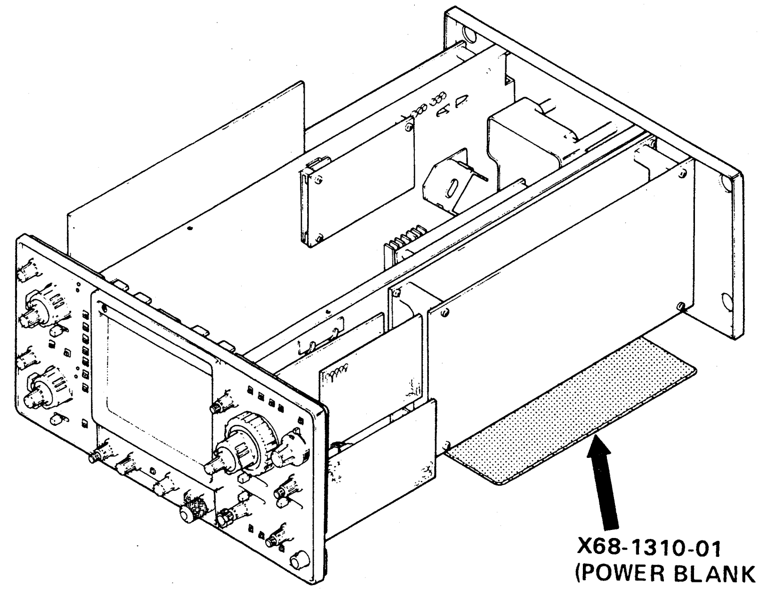


F
G
C54
C53
D13
D12
R71
R72
VR8
PL1
PL2
PL3
PL4
P23b
P26b
VR4a
VR4b
R55
R57
R56
Q21
TC3
R52
P23a
R80
d
+e
C22
C21
C18
R35
R36
R37
P26a
P28

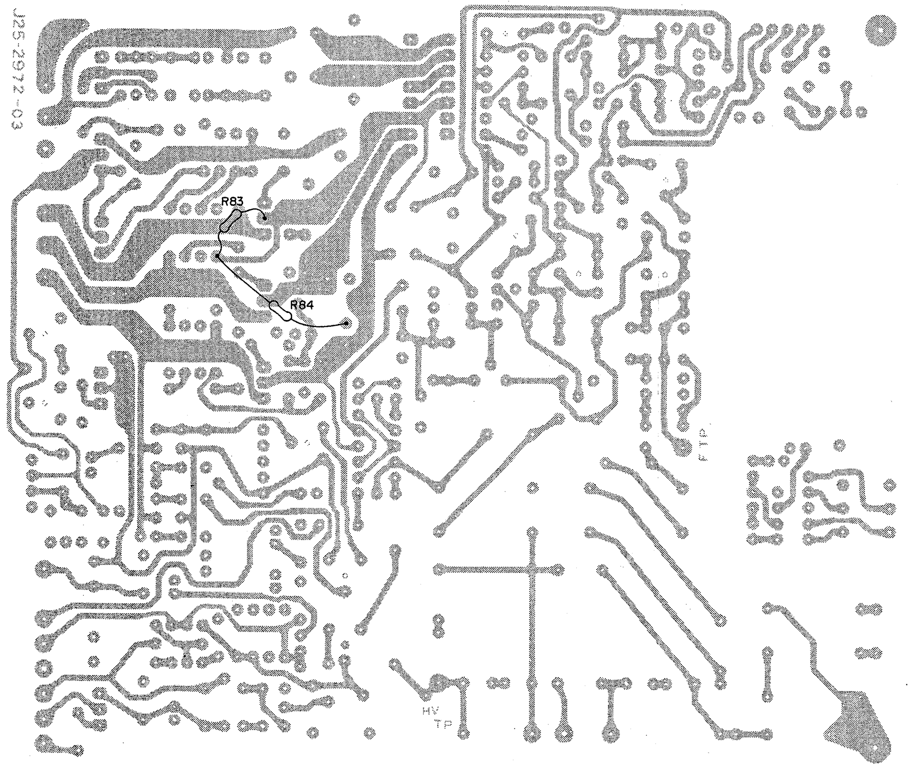
X68-1310-01



(Parts Side View)



X68-1310-01
(POWER BLANKING UNIT)

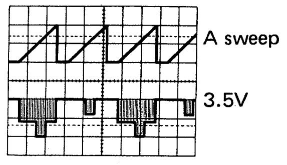


J25-2972-03
R83
R84
FTP
HV TP

(Foil Side View)

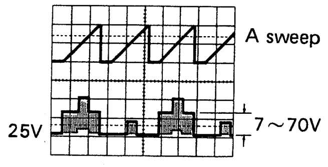
WAVEFORMS

①



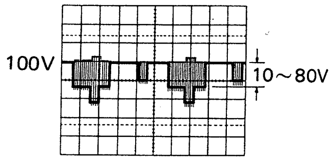
H.DISPLAY :ALT

②



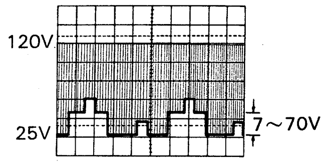
H.DISPLAY: ALT

③



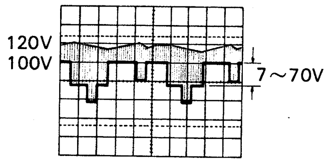
H.DISPLAY: ALT

④



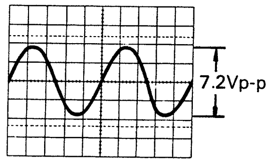
H.DISPLAY: ALT

⑤

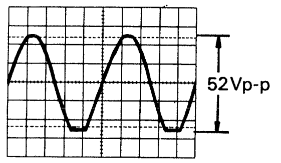


H.DISPLAY: ALT

⑥

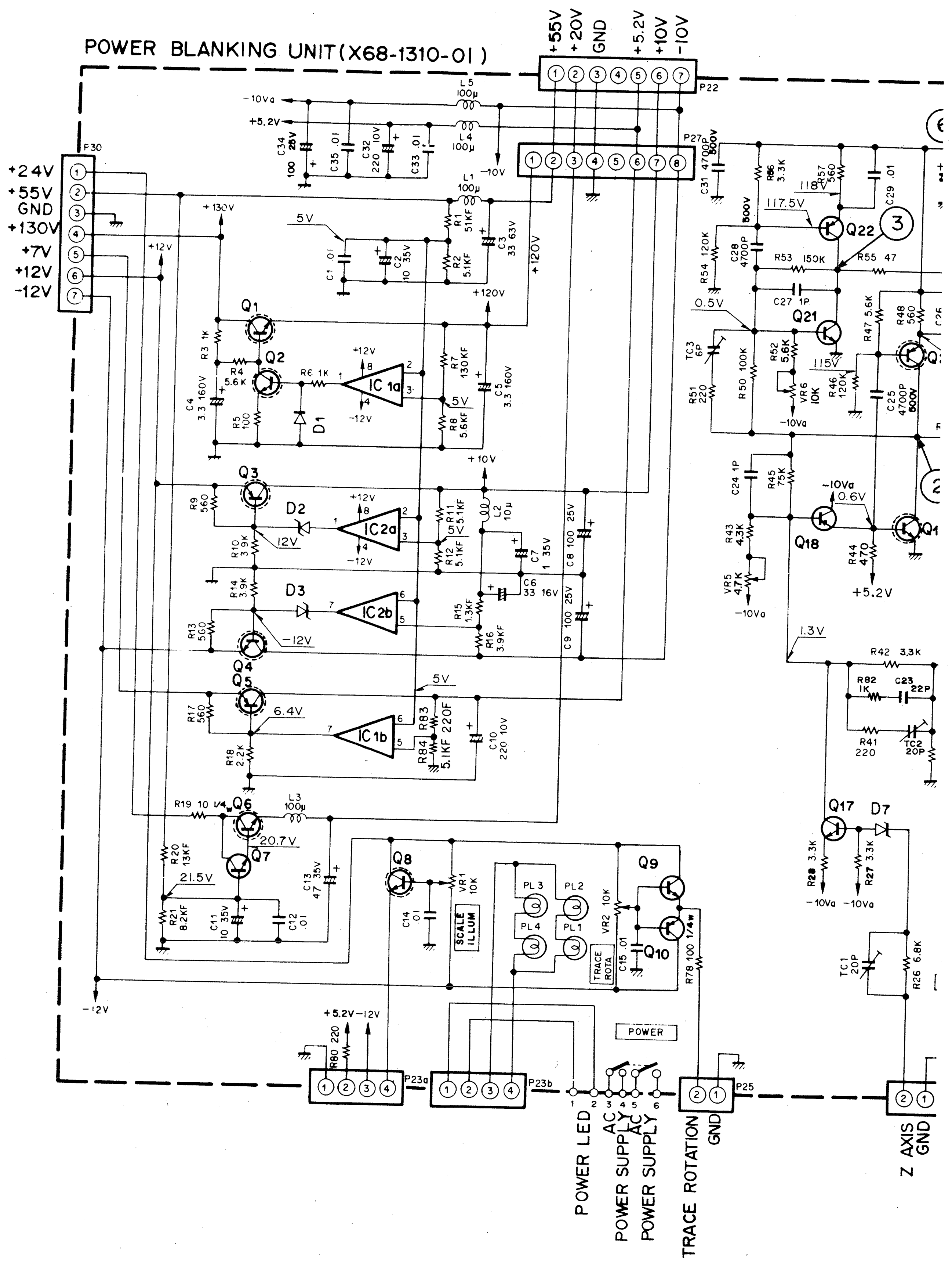


⑦

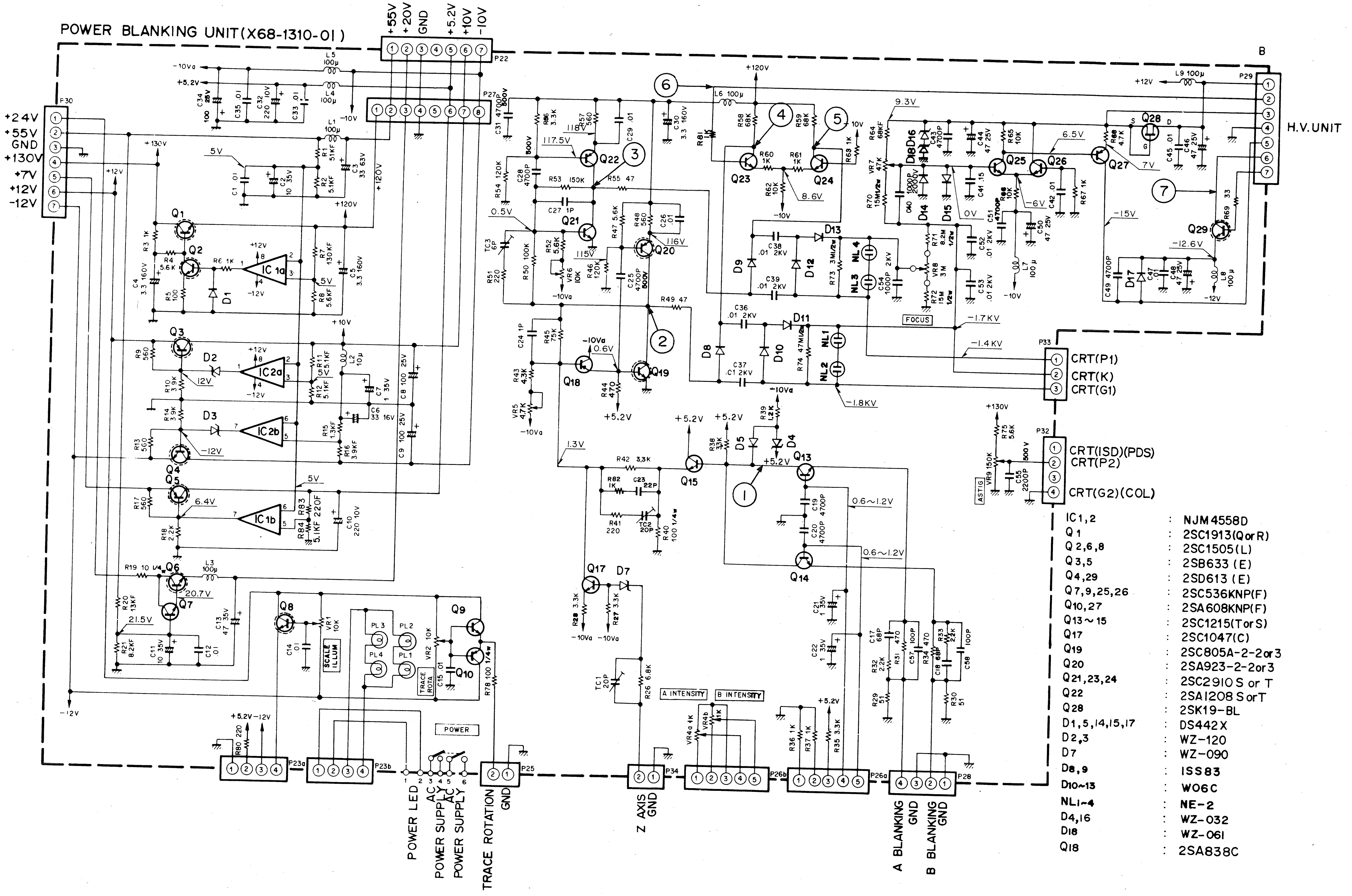


Note: ▨ : CHOP Operation

SCHEMATI


POWER BLANKING UNIT(X68-1310-01)
+55V
+20V
GND
+5.2V
+10V
-10V
P22
P27
F30
+24V
+55V
GND
+130V
+7V
+12V
-12V
-10Va
+5.2V
L5 100μ
L4 100μ
L1 100μ
C34 100 25V
C35 .01
C32 220 10V
C33 .01
+130V
5V
C1 .01
C2 10 35V
R1 51KF
R2 5.1KF
C3 33 63V
+120V
Q1
Q2
R3 1K
R4 5.6K
R5 100
C4 3.3 160V
R6 1K
D1
IC 1a
+12V
-12V
R7 130KF
R8 5.6KF
C5 3.3 160V
+10V
Q3
D2
IC2a
R9 560
R10 3.9K
12V
R11 5.1KF
R12 5.1KF
L2 10μ
C7 1 35V
C6 33 16V
C8 100 25V
D3
IC2b
R14 3.9K
R13 560
Q4
-12V
R15 1.3KF
R16 3.9KF
C9 100 25V
Q5
5V
6.4V
IC1b
R17 560
R18 2.2K
R83
R84 5.1KF 220F
C10 220 10V
R19 10 1/4W
Q6
L3 100μ
20.7V
Q7
R20 13KF
21.5V
R21 8.2KF
C11 10 35V
C12 .01
C13 47 35V
Q8
C14 .01
VR1 10K
SCALE ILLUM
PL3
PL2
PL4
PL1
VR2 10K
TRACE ROTA
C15 .01
Q9
Q10
R78 100 1/4W
-12V
+5.2V
-12V
R80 220
P23a
P23b
POWER
P25
POWER LED
POWER SUPPLY AC
POWER SUPPLY AC
TRACE ROTATION
GND
Z AXIS
GND
C31 4700P 500V
R86 3.3K
R57 560
C29 .01
118V
117.5V
Q22
③
R54 120K
C28 4700P 500V
R53 150K
R55 47
C27 1P
0.5V
Q21
R47 5.6K
R48 560
TC3 6P
R52 5.6K
115V
VR6 10K
R46 120K
R51 220
R50 100K
-10Va
C25 4700P 500V
C24 1P
R45 75K
-10Va
0.6V
Q18
R43 4.3K
VR5 4.7K
-10Va
R44 470
+5.2V
1.3V
R42 3.3K
R82 1K
C23 22P
R41 220
TC2 20P
Q17
D7
R28 3.3K
R27 3.3K
-10Va
-10Va
TC1 20P
R26 6.8K

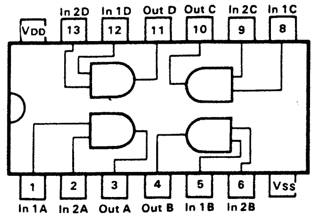
SCHEMATIC DIAGRAM


POWER BLANKING UNIT(X68-1310-01)
+55V
+20V
GND
+5.2V
+10V
-10V
P22
P27
P30
+24V
+55V
GND
+130V
+7V
+12V
-12V
B
P29
H.V.UNIT
P33
CRT(P1)
CRT(K)
CRT(G1)
P32
CRT(ISD)(PDS)
CRT(P2)
CRT(G2)(COL)
ASTIG
FOCUS
IC 1a
IC 2a
IC 2b
IC 1b
SCALE ILLUM
TRACE ROTA
POWER
A INTENSITY
B INTENSITY
P23a
P23b
P25
P34
P26b
P26a
P28
POWER LED
AC POWER SUPPLY
AC POWER SUPPLY
TRACE ROTATION
GND
Z AXIS
GND
A BLANKING
GND
B BLANKING
GND
-1.7KV
-1.4KV
-1.8KV
9.3V
6.5V
-15V
-12.6V
-6V
0V
7V
117.5V
116V
115V
0.5V
1.3V
0.6V
21.5V
20.7V
6.4V
0.6~1.2V
0.6~1.2V

IC1,2	:	NJM4558D
Q1	:	2SC1913(QorR)
Q2,6,8	:	2SC1505(L)
Q3,5	:	2SB633 (E)
Q4,29	:	2SD613 (E)
Q7,9,25,26	:	2SC536KNP(F)
Q10,27	:	2SA608KNP(F)
Q13~15	:	2SC1215(TorS)
Q17	:	2SC1047(C)
Q19	:	2SC805A-2-2or3
Q20	:	2SA923-2-2or3
Q21,23,24	:	2SC2910 S or T
Q22	:	2SA1208 S or T
Q28	:	2SK19-BL
D1,5,14,15,17	:	DS442X
D2,3	:	WZ-120
D7	:	WZ-090
D8,9	:	ISS83
D10~13	:	W06C
NL1~4	:	NE-2
D4,16	:	WZ-032
D18	:	WZ-061
Q18	:	2SA838C

SEMICONDUCTORS

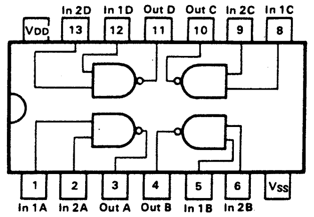
C-MOS IC



VDD
In 2D
In 1D
Out D
Out C
In 2C
In 1C
Vss
In 1A
In 2A
Out A
Out B
In 1B
In 2B

Top view

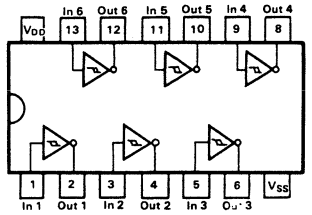
MC14081BCP



VDD
In 2D
In 1D
Out D
Out C
In 2C
In 1C
Vss
In 1A
In 2A
Out A
Out B
In 1B
In 2B

Top view

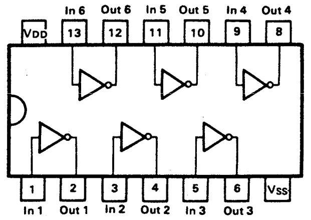
MC14011BCP



VDD
In 6
Out 6
In 5
Out 5
In 4
Out 4
Vss
In 1
Out 1
In 2
Out 2
In 3
Out 3

Top view

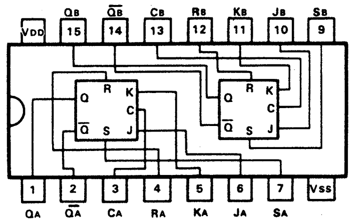
MC14584BCP



VDD
In 6
Out 6
In 5
Out 5
In 4
Out 4
Vss
In 1
Out 1
In 2
Out 2
In 3
Out 3

Top view

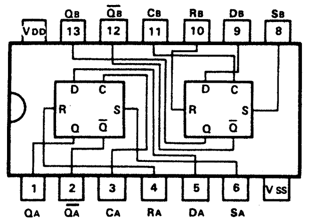
MC14069UBCP



VDD
QB
Q̄B
CB
RB
KB
JB
SB
Vss
QA
Q̄A
CA
RA
KA
JA
SA

Top view

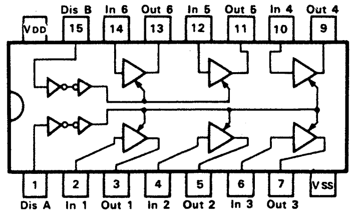
MC14027BCP



VDD
QB
Q̄B
CB
RB
DB
SB
Vss
QA
Q̄A
CA
RA
DA
SA

Top view

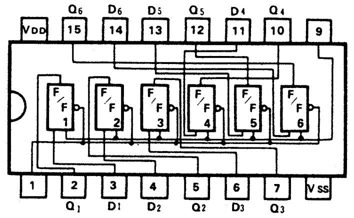
MC14013BCP



VDD
Dis B
In 6
Out 6
In 5
Out 5
In 4
Out 4
Vss
Dis A
In 1
Out 1
In 2
Out 2
In 3
Out 3

Top view

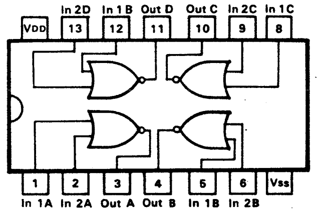
MC14503BCP



VDD
Q6
D6
D5
Q5
D4
Q4
Vss
Q1
D1
D2
Q2
D3
Q3

Top view

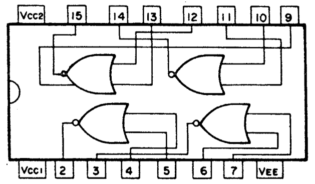
MC14174BCP



VDD
In 2D
In 1B
Out D
Out C
In 2C
In 1C
Vss
In 1A
In 2A
Out A
Out B
In 1B
In 2B

Top view

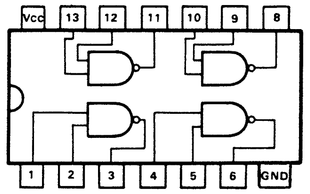
MC14001BCP



VCC2
VCC1
VEE

MC10102P

TTL IC

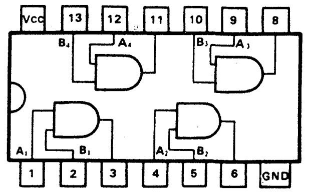


Top view

SN74S00N

SN74LS00N

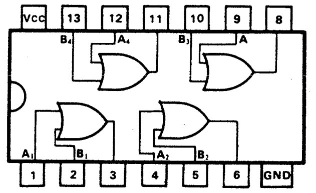
74F00PC



Top view

SN74LS08N

SN74S08N

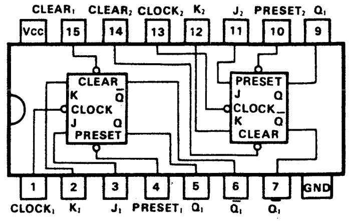


Top view

SN7432N

SN74LS32N

SN74S32N

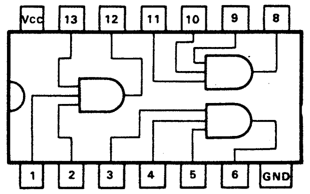


CLEAR1
CLEAR2
CLOCK2
K2
J2
PRESET2
Q2
Vcc
CLEAR
CLOCK
PRESET
GND
CLOCK1
K1
J1
PRESET1
Q1
Q̄1
Q̄2

Top view

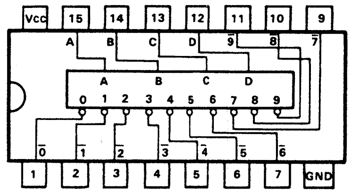
SN74LS112AN

SN74S112N



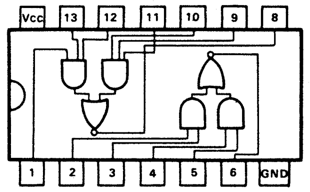
Top view

SN74LS11N



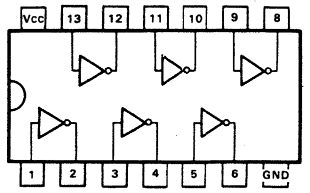
Top view

SN7442AN



Top view

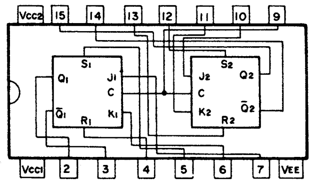
SN74LS51N



Top view

SN7404N

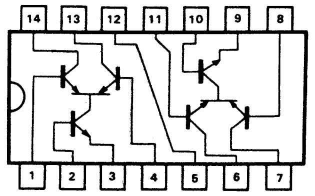
SN74LS04N



VCC2
VCC1
VEE

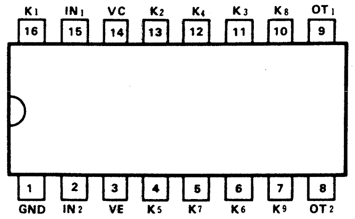
MC10135P

OTHER



Top view

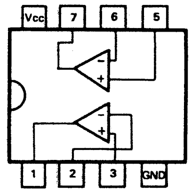
CA3102E



K1
IN1
VC
K2
K4
K3
K8
OT1
GND
IN2
VE
K5
K7
K6
K9
OT2

Top view

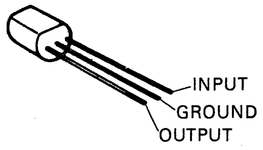
ATM-4010



Top view

TL082CP

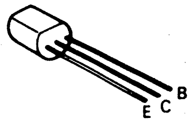
NJM4558D



INPUT
GROUND
OUTPUT

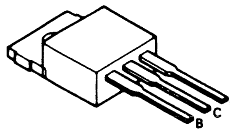
MC78L05C

TRANSISTOR

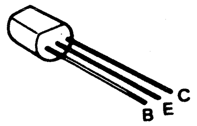


2SA608KNP (F)
2SA838 (C)
2SA896-2-2
2SD438 (F)
2SC536KNP (F)

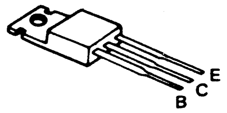
2SC1047 (C)
2SC1215 (T or S)
2SC1811-2-2
2SC1973 (T)
2SC2910 (S or T)
2SA1208 (S or T)



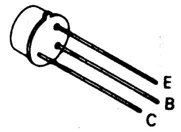
2SB633 (E)
2SD613 (E)
2SC1505 (L)



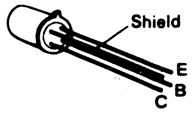
2SA1161
2SC2499
2SC2644
2SC2671
2SC2407



2SC1913 (Q, R)

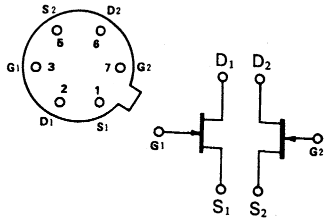


2SA923-2-2 or 3
2SC805A2-2 or 3



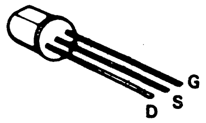
2SC1164 (O)

FET.

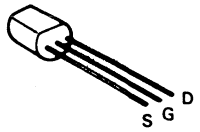


S2
D2
G1
G2
D1
S1
5
6
3
7
2
1
D1
D2
G1
G2
S1
S2

U440 DN1901



2SK19 (BL)



2SK30A (O)

CS-2070 SERVICE MANUAL CHANGE INFORMATION:

At Trio, we continually strive to keep up with latest electronic developements by adding circuit and component improvement to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these change immediately into printed manual.

Also, a single change may affect several section. Since the change information sheets are permanently entered, some duplication may occur.

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the replaceable electrical parts list. (Main chassis)

PARTS LIST

Note: A: Addition
C: Change
D: Deletion

S/No. 2120001 ~
VERTICAL ATTENUATOR (X75-1120-01)

Ref. No.	Parts No.	Name & Description	Note
R32	RN14BK2B5600F	RN 560Ω ±1% 1/8W	C
R33	RN14BK2B5600F	RN 560Ω ±1% 1/8W	C
R74	RN14BK2B5600F	RN 560Ω ±1% 1/8W	C
R75	RN14BK2B5600F	RN 560Ω ±1% 1/8W	C
IC12		IC ATM-4020	C
IC13		IC ATM-4020	C

S/No. 3010001 ~
POWER BLANKING (X68-1310-01)

Ref. No.	Parts No.	Name & Description	Note
R53	RD14BB2C753J	RD 75kΩ	C

S/No. 3020001 ~
POWER BLANKING (X68-1310-01)

Ref. No.	Parts No.	Name & Description	Note
Q1		TR 2SC2591(Q or R)	C

S/No. 3040001 ~
TRIG SWEEP (X74-1320-01)

Ref. No.	Parts No.	Name & Description	Note
R269	RD14BB2C162J	RD 1.6kΩ	C
R272	RD14BB2C162J	RD 1.6kΩ	C
R287	RD14BB2C471J	RD 470Ω	C
D67		Diode GMA-01	A
D68		Diode GMA-01	A
D69		Diode GMA-01	A
D70		Diode GMA-01	A
D71		Diode GMA-01	A

PARTS LIST

S/No. 3050001 ~
VERTICAL PRE AMPLIFIERE (X73-1320-01)

Ref. No.	Parts No.	Name & Description				Note
C1	CC45CH1H120J	CC	12pF	±5%		D
C2	CC45CH1H100J	CC	10pF	±5%		D
C5	CC45CH1H020C	CC	2pF	±0.25pF		C
C9	CC45CH1H270J	CC	27pF	±5%		C
C13	CC45CH1H270J	CC	27pF	±5%		D
C14	CC45CH1H100J	CC	10pF	±5%		C
C16	CC45CH1H270J	CC	27pF	±5%		A
C23	CC45CH1H680J	CC	68pF	±5%		D
C34	CC45CH1H120J	CC	12pF	±5%		C
C35	CC45CH1H120J	CC	12pF	±5%		C
C38	CC45CH1H270J	CC	27pF	±5%		D
C39	CC45CH1H150J	CC	15pF	±5%		D
C42	CC45CH1H020C	CC	2pF	±0.25pF		C
C46	CC45CH1H270J	CC	27pF	±5%		C
C49	CC45CH1H020C	CC	2pF	±0.25pF		A
C51	CC45CH1H100J	CC	10pF	±5%		C
C60	CC45CH1H680J	CC	68pF	±5%		D
C108	CC45CH1H330J	CC	33pF	±5%		A
C115	CC45CH1H330J	CC	33pF	±5%		D
C116	CC45CH1H080D	CC	8pF	±0.5pF		D
C119	CC45CH1H101J	CC	100pF	±5%		D
C120	CC45CH1H220J	CC	22pF	±5%		D
C131	CC45CH1H070D	CC	7pF	±0.5pF		A
C132	CC45CH1H070D	CC	7pF	±0.5pF		A
C175	CC45CH1H020C	CC	2pF	±0.25pF		C
C176	CC45CH1H050C	CC	5pF	±0.25pF		D
C208	CC45CH1H050C	CC	5pF	±0.25pF		A
C209	CC45CH1H050C	CC	5pF	±0.25pF		A
C210	CK45B1H103K	CK	0.01μF	±10%		A
TC12	C05-0062-05	TC	6pF			A
R3	RN14BK2B2700F	RN	270Ω	±1%	1/8W	C
R4	RD14BB2C121J	RD	120Ω			D
R5	RD14BB2C472J	RD	4.7kΩ			D
R26	RD14BB2C470J	RD	47Ω			C
R38	RD14BB2C151J	RD	150Ω			C
R40	RN14BK2B1800F	RN	180Ω	±1%	1/8W	C
R48	RD14BB2C100J	RD	10Ω			C
R49	RD14BB2C472J	RD	4.7kΩ			D
R54	RN14BK2B2400F	RN	240Ω	±1%	1/8W	C
R58	RD14BB2C682J	RD	6.8kΩ			A
R85	RD14BB2C473J	RD	47kΩ			C
R86	RD14BB2C473J	RD	47kΩ			C
R115	RD14BB2C471J	RD	470Ω			C
R118	RN14BK2B2700F	RN	270Ω	±1%	1/8W	C
R150	RD14BB2C470J	RD	47Ω			C
R166	RN14BK2B2700F	RN	270Ω	±1%	1/8W	C
R167	RD14BB2C330J	RD	33Ω			D
R168	RD14BB2C102J	RD	1kΩ			D
R199	RD14BB2C470J	RD	47Ω			C
R211	RD14BB2C151J	RD	150Ω			C
R213	RN14BK2B1800F	RN	180Ω	±1%	1/8W	C
R221	RD14BB2C100J	RD	10Ω			C
R227	RN14BK2B2000F	RN	200Ω	±1%	1/8W	C
R277	RD14BB2C471J	RD	470Ω			C
R280	RN14BK2B2700F	RN	270Ω	±1%	1/8W	C
R290	RD14BB2C153J	RD	15kΩ			D
R291	RD14BB2C272J	RD	2.7kΩ			D
R293	RD14BB2C331J	RD	330Ω			A
R294	RD14BB2C331J	RD	330Ω			A
R295	RD14BB2C103J	RD	10kΩ			D
R317	RD14BB2C473J	RD	47kΩ			D

PARTS LIST

Ref. No.	Parts No.	Name & Description				Note
R318	RD14BB2C473J	RD	47kΩ			D
R319	RD14BB2C103J	RD	10kΩ			D
R320	RD14BB2C822J	RD	8.2kΩ			–
R321	RD14BB2C103J	RD	10kΩ			D
R322	RD14BB2C103J	RD	10kΩ			D
R323	RD14BB2C752J	RD	7.5kΩ			D
R324	RD14BB2C332J	RD	3.3kΩ			D
R325	RD14BB2C470J	RD	47Ω			C
R326	RD14BB2C470J	RD	47Ω			C
R329	RD14BB2C472J	RD	4.7kΩ			A
R333	RD14BB2C620J	RD	62Ω			C
R334	RD14BB2C620J	RD	62Ω			C
TH1		Thermister SDT-1000				D
Q79		TR	2SC536KNP (F)			D
D40		Diode	1S2686			D
D41		Diode	1S2686			D
D42		Diode	1S2686			D
D43		Diode	1S2686			D
D44		Diode	DS442X			D

VERTICAL ATTENUATOR (X75-1120-01)

Ref. No.	Parts No.	Name & Description				Note
C7	CC45CH1H030C	CC	3pF	±0.25pF		A
C20	CC45CH1H030C	CC	3pF	±0.25pF		A
R36	RD14BB2C151J	RD	150Ω			A
R37	RD14BB2C151J	RD	150Ω			A
R38	RD14BB2C330J	RD	33Ω			A
R39	RD14BB2C330J	RD	33Ω			A

VERTICAL OUTPUT (X73-1330-01)

Ref. No.	Parts No.	Name & Description				Note
C18	CC45CH1H070D	CC	7pF	±0.5pF		D
C19	CK45B1H102K	CK	1000pF	±10%		C
C20	CC45CH1H070D	CC	7pF	±0.5pF		D
C25	CC45CH1H331J	CC	330pF	±5%		A
C26	CC45CH1H331J	CC	330pF	±5%		A
C27	CC45CH1H020C	CC	2pF	±0.25pF		A
R12	RD14BB2C302J	RD	3kΩ			D
R13	RD14BB2C122J	RD	1.2kΩ			D
R16	RN14BK2E6200F	RN	620Ω	±1%	1/4W	D
R17	RN14BK2E6200F	RN	620Ω	±1%	1/4W	D
R22	RD14BB2C151J	RD	150Ω			C
R23	RD14BB2C101J	RD	100Ω			A
R24	RD14BB2C220J	RD	22Ω			A
R29	RD14BB2E100J	RD	10Ω	±5%	1/4W	C
R34	RD14BB2C471J	RD	470Ω			D
R37	RD14BB2C471J	RD	470Ω			D
R40	RD14BB2C181J	RD	180Ω			C
R46	RD14BB2C181J	RD	180Ω			C
R49	RD14BB2C561J	RD	560Ω			A
R51	RD14BB2C471J	RD	470Ω			A
R52	RD14BB2C471J	RD	470Ω			A
R55	RD14BB2C221J	RD	220Ω			A
R58	RD14BB2C621J	RD	620Ω			A
R59	RD14BB2C621J	RD	620Ω			A
R60	RN14BK2B3600F	RN	360Ω	±1%	1/8W	A
R61	RN14BK2B3600F	RN	360Ω	±1%	1/8W	A
R62	RD14BB2C220J	RD	22Ω			A
R63	RD14BB2C220J	RD	22Ω			A

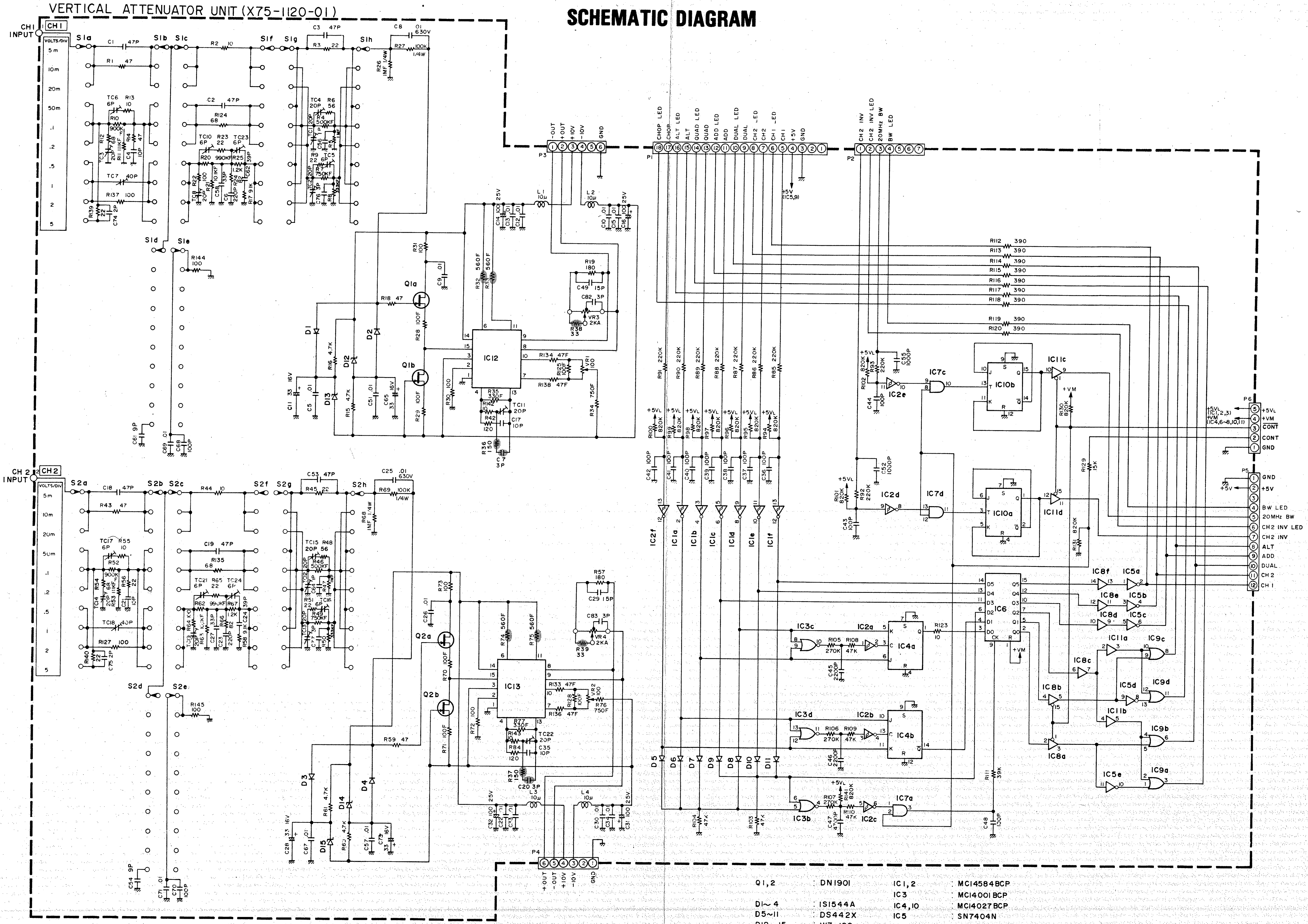
PARTS LIST

Ref. No.	Parts No.	Name & Description	Note
L1	L40-2282-13	Ferri inductor 0.22μH	D
L2	L33-0806-05	Choke coil 0.7μH	C
L4	L40-2282-13	Ferri inductor 0.22μH	D
L5	L33-0806-05	Choke coil 0.7μH	C
L8	L40-1011-03	Ferri inductor 100μH	D
D1		Diode DS442X	A
Q1		TR 2SC2671	C
Q2		TR 2SC2671	C
Q3		TR 2SC1215 (T or S)	C
Q4		TR 2SC1215 (T or S)	C
Q6		TR 2SC1047 (C)	A
Q15		TR 2SA838 (C)	A

TRIG SWEEP (X74-1320-01)

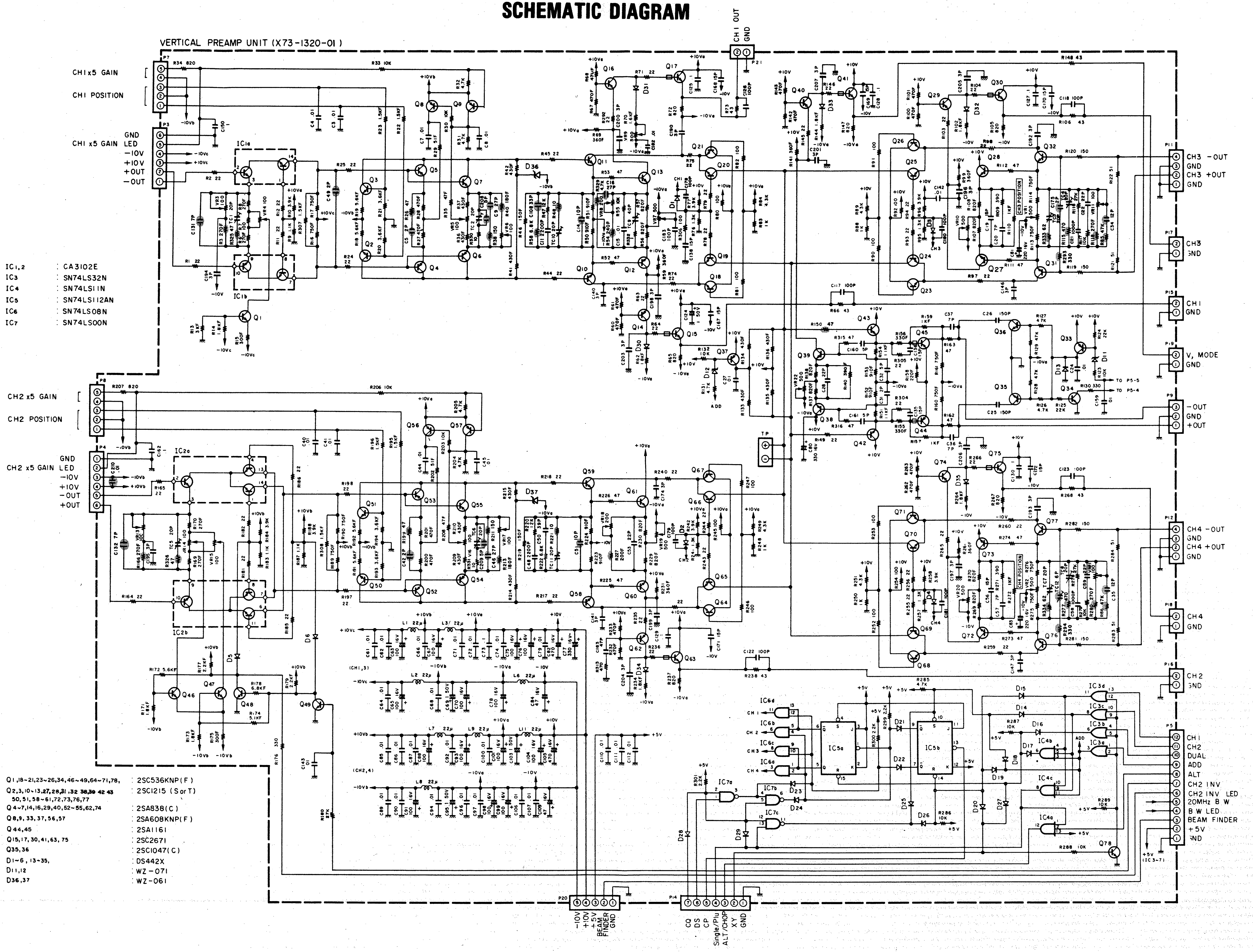
Ref. No.	Parts No.	Name & Description	Note
C11	C91-0549-05	Tantalum 1μF 35V	C
C24	CC45CH1H121J	CC 120pF ±5%	C
C25	CC45CH1H121J	CC 120pF ±5%	C
C36	C91-0549-05	Tantalum 1μF 35V	C
C44	CC45CH1H121J	CC 120pF ±5%	C
C54	CC45CH1H220J	CC 22pF ±5%	C
TC1	C05-0309-05	TC 40pF	C
TC2	C05-0309-05	TC 40pF	C
R49	RN14BK2B2402F	RN 24kΩ ±1% 1/8W	C
R50	RN14BK2B3001F	RN 3kΩ ±1% 1/8W	C
R51	RN14BK2B1501F	RN 1.5kΩ ±1% 1/8W	C
R52	RN14BK2B1202F	RN 12kΩ ±1% 1/8W	C
R55	RN14BK2B3001F	RN 3kΩ ±1% 1/8W	C
R56	RN14BK2B3001F	RN 3kΩ ±1% 1/8W	C
R149	RN14BK2B2402F	RN 24kΩ ±1% 1/8W	C
R150	RN14BK2B3001F	RN 3kΩ ±1% 1/8W	C
R151	RN14BK2B1202F	RN 12kΩ ±1% 1/8W	C
R152	RN14BK2B1501F	RN 1.5kΩ ±1% 1/8W	C
R154	RN14BK2B3001F	RN 3kΩ ±1% 1/8W	C
R155	RN14BK2B3001F	RN 3kΩ ±1% 1/8W	C
R299	RD14BB2C750J	RD 75Ω	C
R301	RD14BB2C272J	RD 2.7kΩ	A
R303	RD14BB2C152J	RD 1.5kΩ	A
R304	RD14BB2C272J	RD 2.7kΩ	A
VR1	R12-2512-05	VR 5kΩ	C
VR2	R12-2512-05	VR 5kΩ	C
VR3	R12-2512-05	VR 5kΩ	C
VR4	R12-2512-05	VR 5kΩ	C
Q82		TR 2SC536KNP (F)	A
Q83		TR 2SC536KNP (F)	A
IC16		IC MC78L15AC	C

SCHEMATIC DIAGRAM


VERTICAL ATTENUATOR UNIT (X75-1120-01)
CH1 INPUT
CH1
VOLTS/DIV
5m
10m
20m
50m
.1
.2
.5
1
2
5
S1a
S1b
S1c
S1d
S1e
S1f
S1g
S1h
CH2 INPUT
CH2
S2a
S2b
S2c
S2d
S2e
S2f
S2g
S2h
Q1a
Q1b
Q2a
Q2b
IC12
IC13
P1
P2
P3
P4
P5
P6
CHOP LED
CHOP
ALT LED
ALT
QUAD LED
QUAD
ADD LED
ADD
DUAL LED
DUAL
CH2 LED
CH2
CH1 LED
CH1
+5V
GND
CH2 INV
CH2 INV LED
20MHz BW
BW LED
-OUT
+OUT
+10V
-10V
+5VL
+VM
CONT
BW LED
20MHz BW
CH2 INV LED
CH2 INV
IC1a
IC1b
IC1c
IC1d
IC1e
IC1f
IC2a
IC2b
IC2c
IC2d
IC2e
IC2f
IC3b
IC3c
IC3d
IC4a
IC4b
IC5a
IC5b
IC5c
IC5d
IC5e
IC6
IC7a
IC7c
IC7d
IC8a
IC8b
IC8c
IC8d
IC8e
IC8f
IC9a
IC9b
IC9c
IC9d
IC10a
IC10b
IC11a
IC11b
IC11c
IC11d

Q1,2	: DN1901	IC1,2	: MC14584BCP
		IC3	: MC14001BCP
D1~4	: 1S1544A	IC4,10	: MC14027BCP
D5~11	: DS442X	IC5	: SN7404N
D12~15	: WZ-120	IC6	: MC14174BCP
		IC7	: MC14081BCP
		IC8,11	: MC14503BCP
		IC9	: SN7432N
		IC12,13	: ATM-4020

SCHEMATIC DIAGRAM

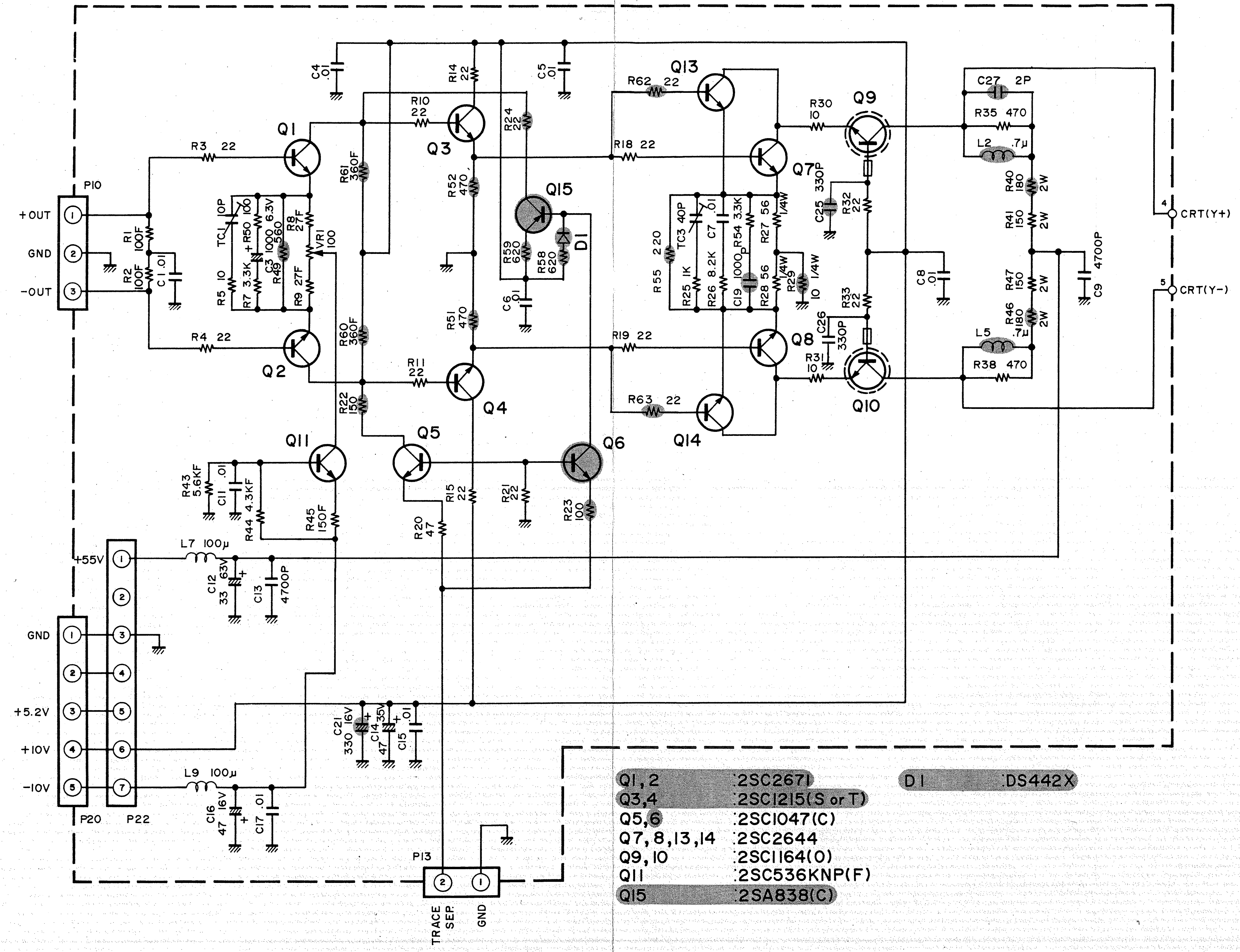

VERTICAL PREAMP UNIT (X73-1320-01)
CH1 OUT
GND
CH1 x5 GAIN
CH1 POSITION
GND
CH1 x5 GAIN LED
-10V
+10V
+OUT
-OUT
CH2 x5 GAIN
CH2 POSITION
GND
CH2 x5 GAIN LED
-10V
+10V
-OUT
+OUT
CH3 -OUT
GND
CH3 +OUT
GND
CH3
GND
CH1
GND
V, MODE
GND
-OUT
GND
+OUT
TP
CH4 -OUT
GND
CH4 +OUT
GND
CH4
GND
CH2
GND
CH1
CH2
DUAL
ADD
ALT
CH2 INV
CH2 INV LED
20MHz B W
B W LED
BEAM FINDER
+5V
GND
-10V
+10V
+5V
BEAM FINDER
GND
CQ
DS
CP
Single/Plu
ALT/CHOP
XY
GND
CH3 POSITION
CH2 POSITION
IC1a
IC1b
IC2a
IC2b
IC3a
IC3b
IC3c
IC3d
IC4a
IC4b
IC4c
IC5a
IC5b
IC6a
IC6b
IC6c
IC6d
IC7a
IC7b
IC7c
P3
P4
P5
P7
P8
P9
P11
P12
P14
P15
P16
P17
P18
P19
P20
P21

IC1,2 : CA3102E
IC3 : SN74LS32N
IC4 : SN74LS11N
IC5 : SN74LS112AN
IC6 : SN74LS08N
IC7 : SN74LS00N

Q1,18~21,23~26,34,46~49,64~71,78, : 2SC536KNP(F)
Q2,3,10~13,27,28,31,32 38,39 42 43 50,51,58~61,72,73,76,77 : 2SC1215 (S or T)
Q4~7,14,16,29,40,52~55,62,74 : 2SA838(C)
Q8,9,33,37,56,57 : 2SA608KNP(F)
Q44,45 : 2SA1161
Q15,17,30,41,63,75 : 2SC2671
Q35,36 : 2SC1047(C)
D1~6, 13~35, : DS442X
D11,12 : WZ-071
D36,37 : WZ-061

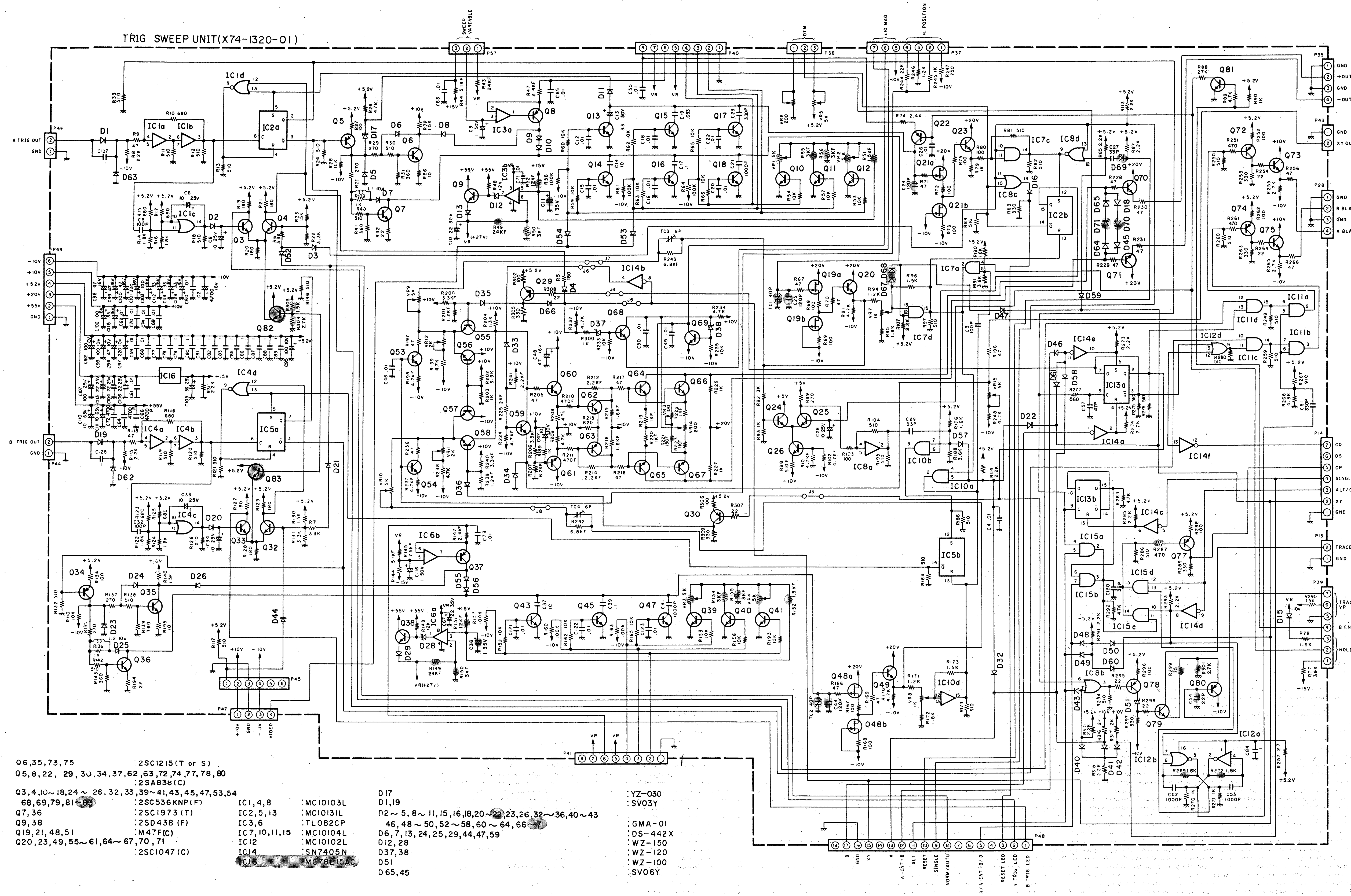
SCHEMATIC DIAGRAM

VERTICAL OUTPUT AMP UNIT(X73-1330-01)


P10
+OUT
GND
-OUT
R1 100F
R2 100F
C1 .01
R3 22
R4 22
Q1
Q2
TC1 10P
R50 100
C3 1000 6.3V
R49 560
R8 27F
VR1 100
R5 10
R7 3.3K
R9 27F
C4 .01
R61 360F
R60 360F
R10 22
R11 22
Q3
Q4
R14 22
R52 470
R51 470
R24 22
Q15
D1
R59 620
R58 620
C5 .01
C6 .01
R22 150
Q11
Q5
Q6
R43 5.6KF
C11 .01
R44 4.3KF
R45 150F
R15 22
R20 47
R21 22
R23 100
Q13
Q14
R62 22
R63 22
R18 22
R19 22
Q7
Q8
R55 220
TC3 40P
C7 .01
R54 3.3K
R27 56
R25 1K
R26 8.2K
C19 1000P
R28 56 1/4W
R29 10 1/4W
C25 330P
C26 330P
R30 10
R31 10
R32 22
R33 22
Q9
Q10
C8 .01
C27 2P
R35 470
L2 .7μ
R40 180 2W
R41 150 2W
R47 150 2W
R46 180 2W
C9 4700P
L5 .7μ
R38 470
CRT(Y+)
CRT(Y-)
+55V
L7 100μ
C12 33 63V
C13 4700P
GND
+5.2V
+10V
-10V
P20
P22
C21 330 16V
C14 47 35V
C15 .01
L9 100μ
C16 47 16V
C17 .01
P13
TRACE SEP.
GND

Q1,2	:2SC2671	D1	:DS442X
Q3,4	:2SC1215(S or T)		
Q5,6	:2SC1047(C)		
Q7,8,13,14	:2SC2644		
Q9,10	:2SC1164(O)		
Q11	:2SC536KNP(F)		
Q15	:2SA838(C)		

SCHEMATIC DIAGRAM

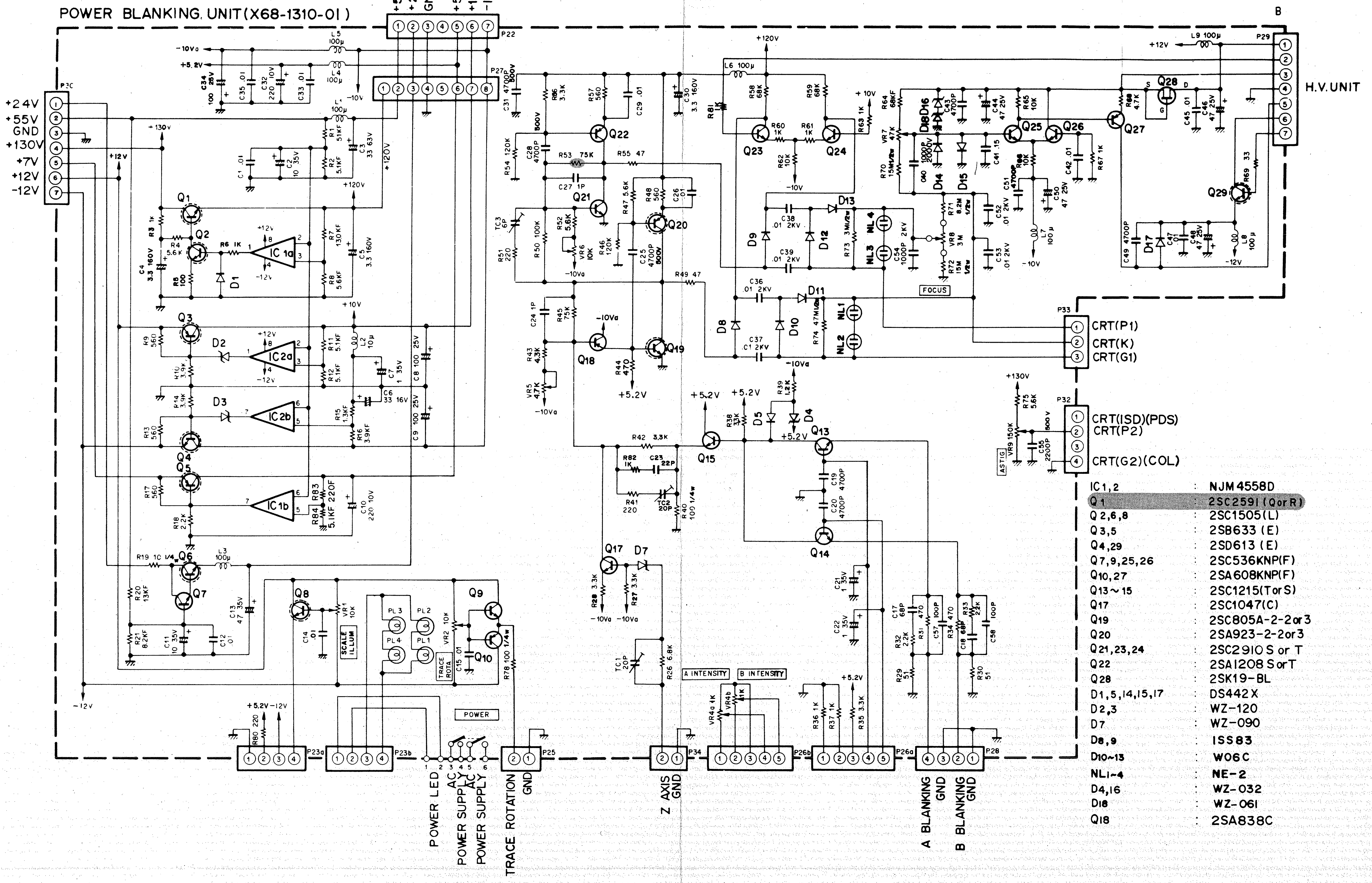

TRIG SWEEP UNIT(X74-1320-01)
SWEEP VARIABLE
P57
P40
DTM
P38
×10 MAG
H. POSITION
P37
P35
GND
+OUT
GND
-OUT
P43
GND
XY OUT
P28
GND
B BLANKING
GND
A BLANKING
P4F
A TRIG OUT
GND
P49
-10V
+10V
+5.2V
+20V
+55V
GND
B TRIG OUT
GND
P44
P14
CO
DS
CP
SINGLE/PLU
ALT/CHOP
XY
GND
P13
TRACE SEP
GND
P39
TRACE SEP VR
B ENDS A
HOLD OFF
P45
P47
+10V
GND
-10V
VIDEO
P41
VR
VR
P48
B
GND
XY
A
A-INT-B
ALT
RESET
SINGLE
NORM/AUTO
A/1-INT-B/B
RESET LED
A TRIG LED
B TRIG LED

Q6,35,73,75 :2SC1215(T or S)
Q5,8,22, 29,30,34,37,62,63,72,74,77,78,80
:2SA838(C)
Q3,4,10~18,24 ~ 26,32,33,39~41,43,45,47,53,54
68,69,79,81~83 :2SC536KNP(F)
Q7,36 :2SC1973(T)
Q9,38 :2SD438(F)
Q19,21,48,51 :M47F(C)
Q20,23,49,55~61,64~67,70,71
:2SC1047(C)

IC1,4,8 :MC10103L
IC2,5,13 :MC10131L
IC3,6 :TL082CP
IC7,10,11,15 :MC10104L
IC12 :MC10102L
IC14 :SN7405N
IC16 :MC78L15AC

D17 :YZ-030
D1,19 :SV03Y
D2~5,8~11,15,16,18,20~22,23,26.32~36,40~43
46,48~50,52~58,60~64,66~71 :GMA-01
D6,7,13,24,25,29,44,47,59 :DS-442X
D12,28 :WZ-150
D37,38 :WZ-120
D51 :WZ-100
D65,45 :SV06Y

SCHEMATIC DIAGRAM


POWER BLANKING UNIT(X68-1310-01)
+55V
+20V
GND
+5.2V
+10V
-10V
P22
P27
P30
+24V
+55V
GND
+130V
+7V
+12V
-12V
B
P29
H.V.UNIT
P33
CRT(P1)
CRT(K)
CRT(G1)
P32
CRT(ISD)(PDS)
CRT(P2)
CRT(G2)(COL)
FOCUS
ASTIG
SCALE ILLUM
TRACE ROTA
POWER
A INTENSITY
B INTENSITY
P23a
P23b
P25
P34
P26b
P26a
P28
POWER LED
POWER SUPPLY AC
POWER SUPPLY AC
TRACE ROTATION
GND
Z AXIS
GND
A BLANKING
GND
B BLANKING
GND

IC1,2	:	NJM4558D
Q1	:	2SC2591(QorR)
Q2,6,8	:	2SC1505(L)
Q3,5	:	2SB633 (E)
Q4,29	:	2SD613 (E)
Q7,9,25,26	:	2SC536KNP(F)
Q10,27	:	2SA608KNP(F)
Q13~15	:	2SC1215(TorS)
Q17	:	2SC1047(C)
Q19	:	2SC805A-2-2or3
Q20	:	2SA923-2-2or3
Q21,23,24	:	2SC2910 S or T
Q22	:	2SA1208 SorT
Q28	:	2SK19-BL
D1,5,14,15,17	:	DS442X
D2,3	:	WZ-120
D7	:	WZ-090
D8,9	:	ISS83
D10~13	:	W06C
NL1~4	:	NE-2
D4,16	:	WZ-032
D18	:	WZ-061
Q18	:	2SA838C